[From Hieronymus Mercurialis: Praelectiones Patavinae. Venetiis, 1603.]

ANNALS OF MEDICAL HISTORY

New Series, Volume III September, 1931 Number 57

TRANSLATION OF A PERSIAN MONOGRAPH ON SYPHILIS

ENTITLED RISÁLA-I-ÁTISHAK BY IMÁD-UL-DÍN MAḤMÚD BIN MASCÚD BIN MAḤMÚD-UL-ṬABÍB

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TEHERAN, PERSIA

The Manuscript

FOR the purpose of this translation I have consulted two manuscripts. One is in the British Museum and is numbered Add. 19619. (Samuel Lee) IX and the other is in my possession. The former is dated 1103 A.H. (= 1692 A.D.), the other is dated 1037 A.H. (= 1627 A.D.), though a later hand has changed the date to 984 A.H. (1576 A.D.). A third manuscript I have recently discovered in the library of the Bengal Asiatic Society in Calcutta, numbered 1557, and wrongly called the Qarábádín-i-Másúmí. It is dated 1059 (= 1649 A.D.). The work itself was finished in 977 A.H. (= 1569 A.D.). This is the earliest monograph dealing with syphilis in the East that is known to exist. Fonahn in his "Zur Quellenkunde Der Persischen Medizin" on page 59 states "*Die publication dieser handschrift wurde von grossem interesse sein in betreff der frage nach der entstehung der syphilis in geographischer hinsicht.*" It is not, however, the earliest reference, as I have found a short account of the disease in the *Tibb-I-Yúsufi*, a treatise on general therapeutics written at Herat in the year 1511 A.D. Its author speaks of the disease as though it were well known and urges the use of mercury in the treatment. It will be remembered that syphilis was recognized or became virulent in Europe about 1493. We may note that in the Orient the classical authors do not mention it and that these two writers describe it as a new disease.

The Author

The author Hakím Imád-ul-Dín Maḥmúd Ibn Mascúd bin Maḥmúd was himself one of the most famous of medieval Persian physicians, flourishing several centuries later than the giants of Arabian medicine Avicenna, Razes, and others. The principal sources of information concerning him are from his own works and from an unpublished manuscript entitled "Ālam Ārái,"[1] In his introduction to a work that he calls "Ul-Taḥfat-ul-Suådiyeh," a manuscript in my possession (apparently unique), he states that he studied medicine, under his father whom he calls Ẓia-ul-Dín Mascúd. On his father's death although he was only fourteen years of age he succeeded him as ophthalmologist to the Muẓafari Hospital in Shiraz. This appointment he held for ten years. But he was not satisfied with this position and he continued his studies under his uncle, also a famous physician, Kamál-ul-Dín Ḥussein who died in the year 953 A.H. (= 1546 A.D.). After his uncle's death in pursuit of further knowledge he travelled to Khorassan and then to Baghdad and finally to Constantinople and Egypt.

On his return some ten years later he was attached for a time to the service of Ābd Ullah K͟han Istajlú, governor of S͟hirván, and from there he was transferred by the order of Shah Taḥmasp (1524–1576 A.D.) to Meshed, as personal physician to Prince Ālí Ibn Músá̱ ul-Reza, the governor. Here he wrote the present tract.

Whilst in the service of Istajlú he had the misfortune to incur his master's dislike who showed it by exposing him all of one night on the ice. He saved his life by dosing himself liberally throughout the night with opium. The date of his death is unknown.

In addition to this pamphlet the following works from his pen have survived.

1. "Ul-Markibát-ul-Sháhiyeh" (*Medicamenta Composita*).
2. "Ul-Taḥfat-ul-Sådiyeh" both in Arabic.
3. A manuel of medicine called "Risála-i-Yanbű."
4. A treatise on the beneficial and injurious properties of opium.
5. A treatise on China root.
6. A treatise on the bezoar stone.

TRANSLATION OF TEXT

Praise be to God, laudable in all His works and blessings upon our prophet, Moḥamed, worthy of praise and honor, and upon his family. So then, be it known, that there is a disease called *átis͟hak*, which did not exist in former times and which medical writers have not described in their books. Of the writers of today there is no one capable of composing such a work and of accurately describing this disease and enumerating the points great and small (although Mír Baha'-ul-Dovleh Núrbak͟hs͟h has composed a work and collected therein the sayings of some of the Greek and experienced Indian physicians. And with regard to this disease has made remarks that we shall quote hereafter. But neglecting the usual custom of scholars, he did not enumerate or even mention its signs, symptoms, and treatment, but rather compressed his account remarking that in this disease not the slightest cure or smallest help from drugs could be obtained. He mentions physicians in a manner quite contrary to the dignity of an author. Some of them he holds up continually for their absurdities and lack of wits, others he says had no leisure to give accurate attention to such a work, quoting Mulla S͟haraf-ul Dín Ḥassan, physician, of S͟hiraz saying that all his time was spent with hemp and opium and that he was always intoxicated [though in this connection nothing has ever been said about him]. Others he says were afflicted with the service of princes and on account of their attention to the service of their masters and of the management of their worldly affairs it was always impossible that they should write anything useful on this subject.

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[1] British Museum Add. Mss. 16, 684.

I, therefore, since I have spent most of my life in practice, had in mind to write on this subject all that I know and could find out and to collect it into a discourse. Still I had not very much leisure. But then I became honored with the friendship of the blessed, threshold kissed prince, lord of men and genies, ‘Ali Ibn Mousá̱ ul-Reza (blessings of God upon him). And I ministered to disease in his auspicious court. And although my ability is very slight and books which are the source of both fundamentals and details of the art were wanting, still from time to time I had leisure, and all that my memory brought to my mind I stored up. And since shortage of capital and loss of means, change of circumstances and cramping of my powers have overtaken me, if any faults or mistakes are discovered, this is my excuse. And from my masters I plead for justice which scatters love and casts an eye upon the wanderer. And so it comes that if it is capable of correction, try to correct it. And if no correction can be made, then clothe it with the shirt of forgiveness. From God the blessed and Almighty comes success.

Be it known then that this disease consists of several distinct forms though it is permissible to join them together into a single entity. But as far as possible in my description, I shall employ terms which are conformable to the rules of the Art as a whole. "Success comes from God alone."

PATHOLOGY OF SMALLPOX

Now with regard to smallpox, it is said that the waste products of menstruation which are mixed and intermingled with the blood and body humors, so long as the unknown humors are pure, there is no trouble or danger therefrom, and Nature seeing this does not attempt to expel them. But if these humors are utilized by the various parts of the body and are expended upon its growth, then the waste products of corrupt menstruation become evident and Nature expels them; or else by some equitable plan the corrupt elements are collected in a vein and Nature (who is protector of the humors) sets the blood in a ferment so that by this motion the corrupt and the non-corrupt are separated. The corrupt are excreted and smallpox becomes apparent.

Occasionally foul air becomes a cause because air exerts an effect both internal and external owing to its passage into the body during the act of inspiration and inhalation. It also passes through the pores of the body. So then foul air has an action upon the tissue fluids and corrupts them and for this reason much waste products are found in the corrupted matter mixed up with the menses. These nature separates out and by means of the ferment voids them. And so throughout the body black bile is burnt up with severe infection. And to such a degree does this reach that fever may be produced with cancer or other swellings or it may cause leprosy and kindred diseases. And this time Nature by means of the fermentation contrives to separate it off and excretes it through the venous stomata, and under the skin pustules and swellings appear. Or it may flow into the joints and severe rheumatism results. Or being of thin consistency it may extend beneath the skin and produce pigmentation. Or it may corrupt the pores and produce a falling out of the hair. Or it may pass into the internal organs, e.g., stomach, or peritoneum, or gut, or again into the liver, kidneys or bladder. And many diseases are thus produced which are incurable howsoever much one may try. The diagnosis requires acute reasoning and the treatment is an urgent necessity. Occasionally the materies morbi enters into the chinks and cellular structures of bones and produces a local swelling with hard nodules, the usual site for these swellings being the forehead and leg. A swelling of bones is not unlikely because the waste products act in exactly the same way as food material acts. And just as growth occurs in various parts owing to a natural development, so also growth may occur in various parts owing to an increase of the tumefactive matter. Observed facts require no argument or proof.

It often happens that the surface of the bone is revealed by the pus and the swelling becomes visible. There remains no room for doubt. For it is highly probable that there is a swelling of the nervous structure that is in relation with the bone and makes one think that this is the cause of the swelling of the bone.

PATHOLOGY OF ÁTISHAK

Now átishak is a disease that springs from the inflammation or infection of the black bile, running a regular course, manifested in the skin or in the internal organs. And on account of the expulsion from the blood that Nature causes by means of a ferment, a break of continuity of the black bilious structures is produced, either with or without tumefaction. It may go on to ulceration or not. No one at this time would connect it with a disease of the black bile because in no disease of this class is the propulsion of the bile due to a ferment as we have described. It is not to be confused with smallpox, also called variola, because in that disease the solution of continuity of the cellular elements is hemorrhagic, occurring in pathological tissue, whereas here the solution of the cells is bilious. What I have said makes it quite obvious that even before its appearance it causes a feeling of heat, and heaviness exists within the veins. And in many cases there is a feeling of fire and great burning.

NAMES OF THE DISEASE

As for the name *ábileh-i-farang* (European smallpox), that name has been given because it resembles *ábileh* (smallpox) which is called in Arabic *jidri*, in arising from a fermentation of the blood. And it is called *farang* (European) because it originated from those parts or parts thereby. It is called *átishak* because of the sensation of heat and burning. And it has been called Armenian sore because it first appeared in the cities of Armenia. These then are its names and the reasons for its names.

Now the present day physicians differ as to whether this is to be included with the diseases mentioned in their textbooks. Some hold that it is a form of *ńar-i-fársí* (lit.: Persian fire i.e., anthrax), and for this reason, it should be called *nár-i-afranji* (i.e., European fire). It is obvious that if they suppose that it resembles this, then the rash of *anthrax* must be of several kinds. One is the pustular type, white or of various colors. When the pustules rupture or are punctured, yellow or white fluid exudes. The margins are undermined: the center is eroded because the inflamed and corrupt materies morbi causes the tissue to disappear. The ulcer appears to be very deep.

Other physicians suppose it to be a kind of scabies or, rather, have called it leprous scabies. But leprous scabies is ichorous or blackish in color, whilst in this disease though it may vary in color, black is the rarest. Still generally speaking in other respects they are alike. But search as I may, I have never found any type of scabies which appears above the neck. The face and the neck escape. And the reason for this is that the materies morbi is heavy and by its nature inclines to the lower parts. And nature too excretes it through the extremities and hence it is mostly found in the hands and legs. And know that *átisẖak* usually appears upon the upper part of the body because the fermentation of which we have already spoken forces upwards the materies morbi. But the materies of scabies passes to the extremities and lower parts of the body—to the lower parts because it is by nature heavy and to the extremities because nature protecting the body as far as possible keeps it far away from the noble organs. Besides, *átisẖak*, is found in the skin, tissues, tendons, nerves, muscles and even bones. It is found also in the internal organs, which is quite different from scabies. Another point of resemblance is that often all the members of the body become extremely heavy. Often it reaches such a degree that it is impossible to lift a pitcher of water. But such a degree is peculiar to this disease.

SYMPTOMS

Symptoms of *átishak* are heaviness of the whole body and weakness of the nerves and muscles to such a degree that the patient is too weak to carry or lift even a small object, a condition which cannot be attributed to any injury or fatigue. Whether the onset be pustular or papular, the patient feels as though the organ has been branded by an iron. Often there is a livid tinge. When the disease occurs in the joints, at night the pain is unendurable. If the materies morbi is accompanied by wind, it breaks out in and migrates to various parts of the body. Sometimes this migration is extremely swift, passing from hand to foot and from the right foot to the left and vice versa or from the right hand to the left and vice versa. And whenever this migration is found, the course is very rapid. In the first days the disease passes through the veins until the papules appear and they take a long time in recovering. It is amongst the characteristics of this disease that its pains are not relieved by liniments and evacuants, but often are rather increased.

Now there are some diseases that do not yield to the routine treatment, such as diarrhea, migraine, and ophthalmia. They require treatment by their specific drugs. And because these conditions are often difficult to eradicate on account of the black bile of the materies morbi and because the radical treatment of these diseases is highly desirable and is for the general good, therefore physicians of wide experience hold that all these diseases are forms of this one disease. Amongst the characteristics of this disease is the fact that sometimes there are found small, hard, glistening, and slightly flattened papules arising from the skin, accompanied by pain and burning. They remain a short time and then disappear. And though this is one of the characteristics of the disease, still it is not universally found in all types.

TYPE DUE TO BLOOD: The signs of the type of the disease that is due to sanguineous black bile, that is to say, blood that has been separated off and inflamed, is the appearance of large ulcers, whose margin is red and whose surface is purple with obvious vessels running out, with the epidermis prominent and heaped up. Confirmatory proof is offered by the patient's personal history, e.g., his temperament, age, the season, previous disposition, native town, build, habits, and occupation.

TYPE DUE TO BILE: This type due to yellow bile is characterized by the appearance of vesicles with small, pointed heads, not very red, with no raising up of the surrounding tissue or swelling of the body. The skin is bile tinged. The spots are discrete and itch, and rapidly become pustular. A thin yellow fluid can be expressed from them which produces pustules wherever it goes. The rash is similar to that of erysipelas or blisters or any other yellow bilious eruption with a black or dark tinge. The personal history that I have described here should be carefully sought for, that the enquiry may end by proof.

TYPE DUE TO PHLEGM: Signs of the type of the disease that is due to phlegm are the presence of a few large and extensive spots without any reddening, jaundice, cyanosis, or black pigmentation but rather of a somewhat whitish tinge. The rash is vesicular. The irritation and burning are very slight. There is some swelling of the back of the eyes and general heaviness of the body with somnolence. The personal history that I have described adds a very weighty proof.

TYPE DUE TO BLACK BILE: Signs of the type that is due to pure black bile are livid and black spots with very little fluid within. And in spite of the fact that the spots are few, the ulceration is a very long time in healing. Within the sanguineous matter is thick and livid, there is not much burning or irritation. The area around the spots is thickened and pigmented. The patient's personal history is considered a strong proof.

ON THE CAUSES OF THE DISEASE

Although as I have already stated, the real cause of the disease is black bile which has become inflamed or infected or separated off and though no type of the disease is without this materies morbi, yet sometimes it happens that the black bilious matter is simple bile, and sometimes it is a bile that is produced from the other humors. And this is of four kinds. The fourth kind is black bile which springs from the very essence of bile. Sometimes this bile is pure and sometimes it is generated mixed with other heterogeneous humors which become fused into one. Occasionally the matter is windy, the wind being generated either from the black bile or from the humors and other fluids. And sometimes it happens that it is combined with watery matter. Of all matter none has so many variants and types as black bile. Hence it is said "Many are the types of Madness," for madness springs from this humor.

Be it known that this disease

occasionally results from an infection. The commonest means of infection is from sexual intercourse. The next commonest is that which results from the hot bath, for in the bath vapors that may be described as noxious, readily escape from the body of the infected person and through inhalation or entry into the internal or external pores of the body produce a great effect. And should one sit in the very place in which an infected person has sat, the effect is even greater. And should it be done with full knowledge the effect is greater still.

Occasionally an uncovered razor cut of which the scab is scratched off, comes in contact with the razor of one infected and then the disease results. And although this condition, is unlikely, still it has been seen. The disease is not hereditary. If the disease occurs in a child, the infection is accidental and is not to be attributed to a congenital lesion. Occasionally infection results from dining in company and it is milk dishes which, when served at dinners, produce the greatest effect of all foods. Its effect is so great in this respect that infection can be conveyed by a cup or a drinking vessel the owner of which himself has the disease. It may be conveyed by clothes, especially trousers and drawers, even after they have been washed. Kissing too is a means of infection. This condition is often not without psychological effects. But if the patient is in ignorance, usually he is saved from these.

TREATMENT OF THE DISEASE

At the onset the best treatment is regulation of the diet and the generation of a pure humor which will expel all the corrupt to the surface. Sometimes the materies morbi is hemorrhagic. Then venesection is absolutely necessary even though the letting of blood allows the black bile to become uppermost and supreme. And sometimes the black bile is generated from blood owing to the expulsion of its matter. Then its own expulsion becomes necessary and venesection brings great good. As to the question whether the physician should await complete coction or not, there is a variety of opinion. Many hold that awaiting coction in the blood is useless for this reason, that, if the materies morbi is thin, then at venesection corrupt blood is shed both thin and middling, and, if it is thick, quite enough of what should be lost is shed and no harm results. Some say that venesection should not be practiced at the beginning, nor *during maturation* too, because letting of thin blood does violence and sets it flowing in the body, mingling it with the healthy blood. And this produces contamination and hence the disease waxes and gains in strength. Others maintain that venesection at this moment eliminates more of the things that ought to be eliminated and merely requires repetition later and produces weakness of the patient. Hence physicians should wait until coction is manifested. But if the disease during the onset and maturation becomes excessive, provided there is no impediment, blood letting can be practiced. And if after venesection excess of humor is found within the body, coction should be brought about by coctants suitable for that particular humor. After that the humor can be eliminated.

Evacuants of Yellow and Black Bile: Thus if the black bile be mixed with yellow bile suitable decoctants are water lilies, liquorice root, black plums, violets, endive seeds, endive root, cassia seeds, and manna. After three days the patient should add peel of the yellow myrobalan, Meccan senna, red rose, fumitory, cuscuta, polypody, pistachios, stoned raisins, white convolvulus, heart of the marrow, and manna. Convolvulus is included although it is a well known purge for phlegm. Still all authorities agree that it is by its nature a purge for yellow bile and a laxative for phlegm, or grant it a purge for phlegm. And since corrupt matter of yellow bile contains both phlegm and yellow bile, therefore, convolvulus will be useful. On the third or fourth day a syrup with these constituents can be given and two days later repeat the syrup of the first day. And on the last day after a rest a pill should be prepared by grinding together, putting through a sieve and mixing with pure water the bitter yellow pill of agaricum, convolvulus, Chinese rhubarb root, colocynth pulp, scammony, bdellium, and gum tragacanth. The pill should be taken in the early morning and then the patient should abstain from work. The patient may also take Meccan senna, red rose, violet, fennel, endive seed, or manna.

During this time the patient should receive one or two ounces daily according to his custom, of shelled or unshelled, dry pulse, domestic fowl or pullet, caraway seeds and cinnamon, these on the day upon which the medicines act or when the bowels have been free from the medicine and coction is complete. And at the end of the day before the food leaves the stomach—and this is a point of practical experience—give him then a drink of rose water with distillate of endive and confection of fleawort seed with purified sugar. On the day of purgation he must eat but once. And if he is satisfied with broth, so much the better. He should not take sour milk nor should it be very cold lest they set up a diarrhea or colic. After the purge put a little rice into the food and let him go to the hot bath. Now all possible care must be taken that the body which has been freed from corrupt humors be not refilled. For the body after its cleansing is like a plot of land which has been cleared of grass, ready for cultivation and where no unwanted weeds may grow. Enough if after this clearing you put in one noxious seed or plant the root of one harmful weed. There will grow twice or thrice the amount of weeds that formerly were found there. And this maxim is of general application.

If the sore has much inflammation and burning or if there is a general heat and scalding, a syrup of violets, black plums or a syrup of water lilies and tamarinds or a syrup of jujubes and oxymel or fleawort seeds or juice of the endive or cassia or purslane seeds should be given to him as required. He should eat shelled peas or lentils and rice with the expressed juice of the kernels of almonds, and fresh coriander seeds and spinach. The patient should abstain from fruit, preparations of milk, and vegetables.

Evacuants of the Black Bilious Humor Combined with Phlegm: If the black bile is mixed with phlegm, decoctants should be used, such as bugloss, lemon balm, jujube, sebestens, liquorice root, fennel, cassia seeds, endive seeds, maiden's hair, conserve of roses, *Aftabi*, and pure sugar cane. After three days he should be given polypody, French lavender, black myrobalan, cuscuta, the wild thyme which is known as *barki kalkik*, peel of the chebulic myrobalan, Meccan senna added to the former potion. He should follow these directions on the fourth and fifth day. On the evening of the fourth, fifth and sixth days before returning to sleep he should prepare a pill of Socotran aloes, convolvulus, cuscuta, red rose, black myrobalan, peel of the chebulic myrobalan, agaricum, and mastich. The constituents should be ground together and put through a sieve and a dose of one or one and a half drachms taken with water. The pill should be followed up by a draught of violets and bugloss in rose water and distillate of bugloss. In the morning he must take the potion we have already described. On the sixth day the treatment is the same as on the first. On the seventh, if he wishes, he may rest quiet; or if it is preferred, he should take a pill composed of the compound yellow pill convolvulus, agaricum, colocynth pulp, bdellium, scammony and Indian salt. They should be ground together, put through a sieve, and taken with water. As soon as the bowels have worked, the patient should take Meccan senna, cuscuta, white convolvulus, violets, fennel, cassia seeds, and the two mannas. During this period his food should be pulse water with savory lamb, young fowl, cummin seed and cinnamon. On the last day, he should take distillate of bugloss, lemon balm seeds, sweet basil, and rose water.

Evacuants of Pure Black Bilious Humor: And if the bilious matter of this disease springs from the black bile itself decoctants of this bile are nearly the same as those that were enumerated before for phlegm. The purges too are similar to those that were mentioned there. But here cuscuta, polypody and black myrobalan are good. But above all Armenian bole and spices and lapis lazuli are to be used internally as a pill, the dose of each being from half a grain to half a drachm. Solid and liquid medicaments on the last day may be as prescribed. And many of the drinks that have been mentioned are suitable such as syrup of bugloss, violets, French lavender and occasionally oxymel and cuscuta if there is phlegm with the bile.

If the Materies Morbi is Sanguineous: If the materies morbi is sanguineous or is derived from blood, the patient should drink syrup of jujubes or violets or bugloss or distillate of bugloss or fumitory or roses or sweet willow. And during the time of the ebullition of the rash, the best foods are shelled peas, rice, expressed almond juice, and spinach. It is permissible to take fowl and mutton, even during the time of the irritation and general weakness.

ON SOME OF THE RULES FOR THE TREATMENT OF THIS DISEASE

It should not be hid that just as amongst the common people it is well known that in smallpox only syrup of grapes and biscuits are given that it may the swifter run its course, so amongst the upper classes it is an established thing to give nettle, fennel, raisins, and lentils boiled up together that the matter of the disease may the quicker become visible. Neither method is without danger because the potency of the materies morbi is increased and though the original potency remains another is added akin to poisonous.

The safest method to employ is an infusion of jujube and confection of jujube and similar sweets which by experience are known to stimulate this disease, without bringing any harm. And so in this malady the best people hold that such foods as honey and sweets should be eaten and they refuse to give diaphoretics and anything that excites the materies morbi or that hurries it to the surface. For these although they bring it to light, yet the matter is rendered violent and the corruption beyond all reckoning. It is better for the patient to be satisfied with such things as shelled peas, rice, juice of almonds, and spinach. And if he feels weak, let him eat chicken or fowl. And if this is not enough let him take thick soup with lamb in it and bread. But let him not eat the rump. Now the hot bath is occasionally to be permitted during the illness provided it is not too hot and the patient does not dally. Of course he will abstain from all sour foods so that he may not later suffer from rheumatism and pains in the bones. It is well known that all foods that strengthen the body, strengthen also the materies morbi if the food is a proper one. And if it is an improper food, the strength it gives is also passing, whereas for the disease it is a cause of ebullition and transgression of its materies morbi.

TREATMENT OF THE MANIFESTATIONS OF ÁTASHAK

Seeing that this disease is generated from humoral matter the scientific treatment is the expulsion of this matter by specific purges as is obvious. After taking such drugs as infusion of purslane and simple rose water (half a drachm of each) let the patient take sugar candy, distillate of fennel, rose water, and lemon balm seeds. Zedoary and aniseed with powdered sugar are not without value. Besides that there is the bitter musk ointment and [?]

If theriaca are employed the best is *taryáq-i-fárúq* or *maṣerodítus*. One to three drachms of each should be used daily. Its use should be followed by spikenard, zedoary, mastich and rose water. White sugar candy should be taken; and inunctions made of an extract of zedoary ointment (composed by the author, afterwards to be described) are very useful especially after elimination is complete and the constitution is changed. The hot bath is absolutely forbidden and all such like, for although it is a rapid mover of evil matter and increases the pain, still since it necessarily causes an ebbing of the strength, it produces ultimately complete calm.

A COLLECTION OF VARIOUS TREATMENTS FOR THIS DISEASE

After administering a clyster and putting the patient in a good state of health by food and drink and after satisfying the "six needs," either inunctions or internal medication is required. Now inunctions are of several kinds which cause a flow of the faculties and expel the materies morbi.

But the best ointment, nay rather a drug to which there is nothing like, is mercury which alone without other medicaments is enough and though there should be a thousand other drugs, cannot be replaced. The cause of this I will relate later. But of internal drugs in addition to those that produce elimination or balance that I have already described there are two other excellent remedies; one is China root in various forms and the other is a drug which contains mercury. I will copy out prescriptions containing both, which the experts in this disease have found useful. Then I will relate my own experience. The prescriptions below were composed by my great-grandfather Moulána 'Imád-ul-Dín Maḥmúd, the physician.

USEFUL PRESCRIPTIONS

Pill for the European Disease: Antimony, pure myrrh and ceruse each ten drachms, lees of wine and rust each five drachms, fleawort seeds three drachms, molybdenum, struthium, and mastich, ten drachms, turpentine resin and good vinegar ten drachms, a little extract of roses, extract of myrtle, hog's fat, and olive oil and ten drachms of white caustic vitriol, thyme, and infusion of lemons. Grind up the rust with the ceruse: mix together the resin and some bdellium: pour over them the vinegar, rust, and ceruse and mix them all well together. Next mix in some mercury. Then take psyllium water and add that. Grind up the remaining constituents, put them through a sieve, and add them. Grind them all up in a mortar until they are well mixed. Then use the preparation as an inunction, four times daily in summer and six times when the weather is cold; in winter when the weather is very cold it may be used up to ten times.

Another ointment. Take this pill. Add ten drachms of each of lentiscus and mercury and a sufficiency of goat's fat.

Another ointment. Take one drachm of mercury, five drachms of euphorbia, sarcocolla, gum benzoin, opopanax, lentiscus, aloes, gum tragacanth, and pure myrrh, equal parts of goat's fat and hog's fat as is required.

Another ointment copied from a source other than that of the previously mentioned mullah, which is good for *nár-i-faranji.* Mix together, three drachms of rust, two drachms of henna leaves, three drachms of Armenian bole, ten drachms of burnt bitter almonds, three drachms of mercury, and thirty drachms of extract of roses.

Another ointment. Two drachms of each of Egyptian colchicum, mallow root, and white sandal wood, five drachms of henna, two drachms of blue bdellium and pure myrrh, ten drachms of mercury, and two drachms of each of the extracts of olive, costus, rose, and green oak apple.

Another ointment. Mercury one drachm, euphorbium, sarcocolla, gum benzoin, opoponax, struthium, lentiscus, blue bdellium of each three drachms, pure myrrh, liquid styrax, Kerman tutty, purified molybdenum and Egyptian colchicum of each two drachms, extracts of red rose, olive, and costus of each one drachm, and of goat's fat a sufficiency.

Another ointment. Mercury one drachm, opoponax three drachms, pure myrrh and blue bdellium three drachms, henna five drachms, lentiscus two drachms, Egyptian colchicum one drachm, extracts of olive, costus, and red rose, and kidney fat as required.

Another ointment. Mercury, infusion of lemon and soap six drachms, sarcocolla one drachm, aloes, molybdenum five drachms, caustic vitriol, infusion of purslane, colocynth two drachms, struthium one drachm, lentiscus six drachms, castor three drachms, extract of purslane one drachm, and fat of sheep's kidneys forty drachms.

Make an emulsion of the mercury with the soap and the lemon. Grind up the other ingredients till they are quite soft. Mix them all together and beat up in a mortar until the mixture turns white.

Another ointment. A pill for the general effects of the disease. Root of liquorice and molybdenum one drachm, mercury one drachm, and olive oil five drachms. This prescription is much used by him whom I mentioned before.

A Prescription of the Author: In my opinion the following prescription is very useful and efficient. Zedoary and colocynth two drachms, struthium and lentiscus two drachms, half a cake of lard soap, henna leaves three drachms, infusion of lemon a sufficiency, colchicum, costus, ervalenta, aristolochia rotunda and longa, laurel pill, pure myrrh, bdellium, sagapenon, opoponax, zedoary, sulphide of mercury, castor, Socotran aloes two drachms of each, mercury four drachms, pyrethrum two drachms, the extracts of camomile, leucoion, lily, old olives and red rose, yellow wax and goat's fat. Mix the extracts with the wax and grind up the roots with rose water. Dissolve the gums in vinegar. Deaden the mercury in the fat. Then mix them all together and try to deaden the mercury. When the mercury is to be incorporated after it is cold, grind it up in a fair mortar. Then set it aside for a few days that its constitution may mature.

Method of Making an Inunction: Divide the ointment up into three parts. When a start is made with the inunction begin with the area between the eyebrows and inunct an area as broad as four fingers round to the nape of the neck. Anoint the whole of the joints in the upper half of the back, the shoulders, the elbows, the wrist, and the joints of the fingers. Anoint too the thighs, knees and joints of the feet. Rub the ointment into the clavicles and sternum as low as the mouth of the stomach. Rub it in also round the navel. The patient should wear woolen clothes on his chest and should guard against cold. He should eat chicken soups, shelled lentils, rice, cinnamon, and spinach and avoid sour foods, milk dishes, and green vegetables. He should drink sugar candy, distillate of bugloss, rose water, and seeds [*sic*]. If silvery patches appear in the mouth, he should gargle with vinegar, rose water, basil seeds, and infusion of fresh coriander. [A later hand has added in the margin "Silver patches may turn black in the mouth, looking like coal. They are the effect of mercury."] He should then wait three days. If he sweats abundantly and all his teeth drop out but with no pain at all, let him wait three more days. Then let him go to the hot bath. Otherwise let him rub in the ointment that remains and then go to the bath. He should wash his body with infusion of violets, colocynth and bran. Then let him wash with soap. This method of inunction cures all types of this disease however long standing it may be. Though if the disease is very strong and has been contracted very long before, perhaps a second course will be required. And if the course is to be repeated, see that not more than one month elapse, between the courses.

If any part of the body starts to hurt, anoint it at once with this ointment and it will soon be cured with the permission of Almighty God. If the disease is very strong and the body can support it, the quantity of mercury can be increased up to six drachms. When they write in prescriptions ten drachms by weight of mercury their meaning is that this should be rubbed in at one sitting and that too in the hot bath. And sometimes it has taken a whole day or night to do it. But I have never employed this method nor do I wish anyone else to. And because of the ultimate ill success of the drug persons begin to question it and because of the excessive use of it in this way people throw doubts upon it. Nay more, on account of such usage it has often happened that patients are inclined to corruption of the liver and hot dropsy manifests itself and they perish or they are overcome with bloody diarrhea and die. Occasionally typhoid fever or meningitis supervenes or they may get a hectic fever, all this being due to lack of attention to the weight of the mercury.

Composition of a Mercurial Paste: In applying an ointment, the region of the master organs should not be covered. So that it is best in administering the drug to give some thing like this mercurial paste (and this is an European prescription). Convolvulus mixed with gum, dried and powdered, agaricum, Turkish aniseed, aristolochia rotunda, saffron, castor, colchicum, galangale, zedoary, opoponax, sagapenon, gum benzoin, sarcocolla, aristolochia longa, myrrh of Mecca, pyrethrum, mercury, Turkish incense, saffron, euphorbium, centaury, rue leaves, pistachio kernels, almonds, green raisins, origany, Armenian bole, henna and scammony from Antioch. Grind up all the drugs separately and sift them. Mix them together with three times the weight of purified honey.

Dose: Twenty to thirty grains, administered with *shula pilao* and plenty of fat.

A mercury pill for one suffering with disseminated *átishak,* with its general manifestations and glandular enlargement. Pyrethrum, castor, lentiscus, yellow sulphur, Turkish incense and mercury. Grind up the sulphur with the mercury. Grind up all the ingredients and put them through a sieve. Add just a little wheaten flour and vinegar and just a trace of corrosive sublimate. Grind it up till it is absolutely soft. Convert the mercury into corrosive sublimate. This remark is not perhaps quite clear, but the meaning is that the mercury should be deadened with vinegar and then mixed with corrosive sublimate and yellow sulphur. After the mercury has been quite deadened add the other ingredients. This is sufficient for two hundred pills. Each pill should be the size of a pea. Give five every morning and five every evening until stomatitis develops. Then cease. Sometimes it happens that the stomatitis develops before the two hundred are finished. In that case get busy with the treatment of the mouth. Gargles should be used of such things as infusion of coriander, infusion of lemon, and infusion of sumach. But I maintain that one ought not to be rash with drugs such as this, for the danger is great. A pill which contains two drachms of mercury should not be rubbed into the body, above all when combined with corrosive sublimate (which is a powerful poison). By corrosive sublimate I translate the word *dáráshkana.* The sulphur too increases the caustic effect of the drug.

Mercury Pill: Author's Prescription: Blue bdellium, gum tragacanth, gum arabic, starch, Chinese zedoary, white convolvulus, agaricum, lentiscus, saffron, cassia fistularis, opoponax, galbanum, sagapenon, sarcocolla, castor, mercury and scammony from Antioch. Grind all the ingredients together, put them through a sieve, add the mercury, and prepare pills as usual.

Dose: three pills. Before taking the pills the patient should abstain for three days from fruit and fat soup should be given. The pills should be administered for seven days according to the constitution of the patient.

And I maintain that this is a perfectly safe method because in such doses a purge could easily rid the body of the mercury and besides the weight of mercury is not great. The number of pills too is not many so that no accident can occur.

An European Prescription for Ātishak: Mercury, lentiscus, castor, yellow sulphur, incense five drachms, walnut shells two drachms, Chinese zedoary five drachms, well tried infusion of purslane, [?], rose water one drachm, lemons nine drachms. With these make pills each the size of a filbert nut. Let the patient take one each morning for three days. But I maintain that this method is too dangerous and is not in accordance with scientific methods. The administering of the electuaries that I have already described is a better line, for from them no danger can ensue. And God knoweth all.

I have copied out these prescriptions that the methods of other men might be known. Drugs such as these have destroyed many people. But the method of my own that I have described has no danger and cures the disease completely by the permission of God, the all praiseworthy, the Almighty.

Cause of the Effects and the Good that Mercury Produces on This Disease

No physician has yet described the good that mercury produces when used as an inunction, and the cause of the great effects that its properties and active principles produce in non-compound preparations, is totally unknown. Some say that its nature is cold and wet in the second degree, others say that it is hot and caustic. Moḥamed Zakarriya says that the nature of mercury is cold, watery, and viscous and that it contains within itself a vehemence and an astringency. And he holds that it can coagulate matter and that the smell of it produces paralysis. When sublimed it becomes sour, acrid, a solvent, and separatant as is proved by the fact that it cures scabies and prurigo if rubbed over them. But I maintain that the non-sublimed too will cure scabies and pruritus. Whenever it is deadened, it becomes good. It will kill lice and a sprinkling of mercury kills mice, so that the toxicity of the drug is obvious. Its nature which is to protect the body, rids the body of its troubles when rubbed in and made to pass through the pores of the skin. Its nature sets up a movement which will drive out the physical damp in order to expel the troubles of the body to such an extent that if there be pains or any break of continuity anywhere, it will cause to pass to the seat of the pain much matter for its correction as soon as the mercury begins to have an effect upon the body. Its nature sets up this movement of matter in order to drive out the troubles. Hence it is that the veins stand out and there is a change of color and much sweating, all because of the expulsion of these troubles. But since the trouble is universal, there is a universal motion of the materies morbi. And now the matter of the disease passes down and is absorbed into the other matters of the body. And so the damage and trouble due to it is removed, nay furthermore, all matter throughout the body is bettered. But in spite of this sometimes the shock to nature on account of the removal of the cause of the trouble and the stirring up of the spirits and humors is so great that a heat is produced within the body, larger than normal. And the matter of the disease, being in motion also, from its movement gets an added heat. The effect of this heat is that the stony materies morbi becomes porous. And when this has become porous, the hot materies by its own and by its acquired heat influences the strong matter so that the stoniness and hardness are removed and it becomes fit to be excreted. And so the matter that was once as hard as a stone becomes soft and porous like ice or snow melting in the sun. And it drives out the disease and the matter of the disease. And although nature alone could not do this, yet now it is effective. The materies morbi is expelled in the attempt of nature to expel the harm and damage that the mercury causes. So that even if we believe that mercury itself is inert as far as expelling of the matter of the disease goes or if we believe that it does in some way lighten or drive it out, yet it is quite certain that it sets up a very brisk downward flow of the body humors whether pure or corrupt.

That this interpretation is correct is proved by the destruction of the louse who flies from its smell and who loses all control of his powers at first and later the skin becomes tight and dry. The louse is a form of physical damp which because of its shortcomings gets a sort of infection which prepares it to become a live louse. And so it is that, just as the louse is affected by the smell of the mercury, so the humors of the body whether good or bad flow down and a great dryness is produced. And that is the reason why such a marked weakness is felt in the body after inunction with mercury, no matter how many rectifying drugs are included in the ointment.

From this description it is evident that one of the causes of the effect of mercury in driving out this disease is that the materies morbi of the disease is intimately mixed with the tissue fluids. Now these are quite healthy. And because the matter of the disease relative to the tissue fluids is very, very small, from this intermingling no change in them takes place, but on the contrary the matter takes on the form of the fluids, and its corrupt constitution disappears. And besides this the rendering porous of the indurations is due to the heat that we have described and the influence of the hot damp in places where the air has produced an effect by resolution and dissolution by these means. And in addition mercury acts upon the materies morbi. And it is enough if any one of these reasons for the expulsion of the matter of the disease is the true one, how much more so if all are. Praise be to God, the benevolent, the knower of all things.

Now the first of those two drugs which are so good and which are administered is China root. This has made its appearance lately. I have already described in a monograph on the subject the various methods of administering it. I have also described its method of action. But I will briefly relate it here too.

METHOD OF ADMINISTERING CHINA ROOT

Know then that the method of taking China root is to take twenty-one ounces of it and divide it up into twenty-one parts. Each day one portion which is about the size of a bean or smaller, those infected with syphilis will grind up very small. Then they boil it with ten pounds of water until the total quantity is reduced by a half. Then they strain it. The residue that is left in the pot they take and heat. They put a quilt over the head so arranged that all the vapor from the pot will be directed upon their body, their head and their face until they break into a sweat. After that they strain it again and drink two cupfuls and finish off the rest in the twenty-four hours. Then they wash themselves in this same infusion, that is to say, they pour a little of the infusion into a clean basin. But when dividing up the medicine five [*sic*] portions should be made of which four are heavy and two light. And every day six drachms should be prepared. It should be prepared in a new, glass vessel which has never contained any fat. If a cauldron is used it should be freshly tinned. The lid should be put on so that no vapor may escape. Every root when it is cooked for the first time should be boiled up separately until it is dry and no damp remains within so that it may not go bad. So arrange that the root of the first day is boiled on the twenty-second day and the root of the eighth day on the fortieth day [sic? thirtieth day] and the root of the twenty-first day on the forty-first day. And during this time abstain from milk dishes, acrid foods, fruit, vegetables, salt, and water. But eat bread without salt and other things. Drink simple syrup and solutions of sugar candy. Put cinnamon into the food. Lamb steaks may be eaten. Sexual intercourse is never allowed. But if there is an intense desire for it, (because China root is an aphrodisiac on account of the excess of damp that lies within it) let him not go to the hot bath but rather pick out on the forty-second day some fruit, such as sweet pomegranate, and to eat that is best. And if he does eat it, he should eat very little. Some people grind up the China root very fine and mix half the amount that I have mentioned with honey. They eat it for forty-one days, and abstain as I have described. Some eat the same amount in twenty days and abstain. The majority observe the forty days. Some cease to abstain after the eighth day. Some after the eighth day eat the full amount for forty days. Accordingly they eat twice. And the fact is that though they try very hard they get very little profit. Some prepare a confection of China root and eat that. In my opinion the essential constituents of a confection are as follows:

Zedoary, aristolochia rotunda, galangale, colchicum, mullein, China rhubarb, cuscuta, black myrobalan, purified spices, white convolvulus, cinnamon, spikenard, lentiscus, nutmeg, saffron, myristica, cloves, cardamom and five parts of China root. Grind up, sift, and mix with three times the amount of honey. Take daily five drachms of this compound until all is consumed. The taking of this and similar remedies is best done in the temperate seasons.

METHOD OF MAKING A DISTILLATE OF CHINA ROOT

A distillate of China root too can be made with cinnamon. To take this is not without profit. It is best to take it after full health has been regained, because then there is no danger if the drug exerts its full effect. And this I have myself proved and this is what Amír Baha'-ul-Dovleh described in his work on medicine.

DESCRIPTION OF THE ARMENIAN SORE: Now the Armenian sore which in Khorasan was often confused with smallpox, owing to the great resemblance, in many cases resembles leprosy in its external form. Many and varied are the varieties. Some cases have large smallpox like lesions which are many in number and confluent, all appearing at once. It becomes vesicular and very large and starts to burn. In some cases in which the fluid is small, ulceration sets in rapidly, accompanied by burning, pain, and great heat similar to erysipelas. Sometimes a dry, rodent ulcer appears and sometimes an open sore. The ulceration is dry and becomes large and even eats up the skin. The usual site of its first appearance is the skin of the head or penis. Occasionally it appears on many organs, one after another, appearing in one place before it has left the last. In some cases spots appear, perhaps in crops, and occasionally they are very extensive on one organ, especially the head. Some parts escape altogether or are but rarely affected, above all the feet. Occasionally there are small, discrete pimples; and a complication of this is a violent heat which conquers the constitution and a fatigue and itching and rheumatic pains, so great that movement is difficult. During the night the pains in the joints are worse. And those who have fewer spots have more pain. Sometimes the pains are so severe that the patient wishes to destroy himself. And occasionally it happens that the patient is paralysed. I myself have seen a woman whose feet for a considerable period were useless, like one paralysed. Sometimes together with the pains in the joints the hands swell up and the patient is troubled with swellings of the conjunctivae and face. His appetite fails and digestion is poor. And sometimes the pain continues from the beginning when the spots appear in great numbers until the end. The crisis in the disease should occur, according to investigations carried out, in about two weeks, unless the case has been mismanaged. But before this, provided the patient has been well treated, he is relieved to a large extent. But a few days later the spots and the pains and the swellings all recur. But in cases where the constitution is strong and the bad humors are scarce, very few spots appear and the complications give but little trouble. It often happens that before the spots appear there is a considerable period of heat and lethargy which is occasionally resistant to treatment and elimination and recurs and then the spots appear quite suddenly. The heat, the weariness and the pains in the limbs appear of themselves and after a few days the spots appear.

Once I saw a woman who for a long time had had a sore throat. She was suddenly attacked with *ábileh-i-farangi*. I myself maintain that the pain of the throat too was due to the spots of *ábileh*. The color of these spots depends upon the color of the materies morbi that produced them. The majority are yellow and those on the superficial layer of the throat are deeply sunk and often produce blood and pus and finally ulcerate. The uvula is frequently involved. Cure is impossible. But the treatment already described and the ointments enumerated there should be employed which should be well rubbed in between the shoulder blades, not failing to massage the region of the clavicles. The pain in the throat is due to the motion of the materies morbi in the ulceration. Occasionally with the advent of a stomatitis the patient recovers. Sometimes the pain in the throat comes first, sometimes last, and sometimes accompanies other rashes. Sayyed says that often the eruption is the first sign and that complications set in after but that sometimes they appear simultaneously.

The disease is the most infectious of all diseases but does not spread rapidly. Infection is more likely to follow sexual intercourse with one suffering from *átisbak* than after simple association. It is caused by the vapors in the hot bath passing from the body of one to the body of another or by the sweat or by contamination of the dressing gown or by clothes much more readily than by mere meeting or inspiration. I maintain that this is correct and for the following reasons:

Nature as far as possible strives to maintain the inner man pure from this impure matter and to expel it from within the body. Hence it is that in conditions in which the internal vapors of the body spread wider, the infectivity is greater, whereas the spread of the vapors of respiration (since the interior is free from this matter) has no such harm. For the materies morbi of this disease is a humor infected and compounded from corrupt humors. But inflamed phlegm and black bile get the upper hand. And this infected humor infects every other humor that predominates within the body and fills it with itself. And sometimes the corrupt humor reaches such a degree that the chancre devours the infections and rots. Often an eruption appears together with complications. The eruption then disappears, but the pain and swelling and indigestion remain until the final crisis occurs. And with it sometimes great heat manifests itself also.

One overwhelmed in this sickness and treated may remain diseased for two, three or four years or even more, it making no difference whether the spots are but few or many. But many sores after the critical time that we have described is complete do not occur. With treatment health can be attained. But in some cases in which the humors are corrupt within the body and the rash is extensive and the treatment bad, death follows.

Treatment should begin by a clyster. Strengthening food should be used provided it is not sour. The first should be assuaged with preparations of camphor, etc. Whenever the ingestion of anything sour or cold causes pain it is a sign that the materies morbi is phlegm infected with pus and for the future they should be avoided. But if the reverse happens, then know that the humor is inflamed. In this case sour strengthening foods are employed. When the spots come out one by one to put a drop of specially prepared aqua fortis upon each one is of the greatest value. And to be continually eating and smelling nourishing foods after a clyster suitable to the humor has been administered is essential. It is most necessary too to avoid sweet things and hot spices which cause acidity and excitement. Similarly anything that causes wind or drunkenness in this disease is harmful. Every month several times good laxatives should be employed such as cods of cassia fistula in a suitable solvent with manna and the juice of a pomegranate and an infusion of Meccan senna. Myrobalans too are suitable. At the beginning of each month scarification of the leg is of the greatest use. And to rub the site of rheumatic pains with specially prepared aqua fortis is very useful and to follow the aqua fortis with an inunction of the extract of Meccan myrtle dissolved in it, gives great relief to the pain. An extract of the kernels of bitter apricots is very good if rubbed on. The vapors of myrtle leaves, tamarisk tree, sandal wood, and assafetida several times a week is good for a patient who has many spots when the disease is in defervescence. To wash daily the site of the trouble with the infusion of assafetida root, red rose, myrrh and tamarisk tree in which a little vinegar has been mixed is useful, especially in the hot weather. To anoint the chancre and to rub painful spots with zedoary and rose water mixed is useful. When the disease is due to sexual intercourse it is very useful and often brings about a cure to instil into the urethra every night zedoary ground up with water and to drive it in combined with the fat of fowls. It can be rubbed on to the testicles too. In Resht they mix [?] with water and rub it on to the spots once a week in two drachm doses. In doses of one drachm they administer it as an elixir combined with honey. Vomiting and diarrhea occasionally occur. This is extremely useful and many are cured in this way.

To take every morning zedoary mixed in rose water or the animal bezoar stone or Armenian bole or sigillean earth in water or in a suitable syrup or the "curative pill" dissolved in pomegranate juice or the "health preserver" or the "perfect antidote" and such like, to do any of these things is to root out the disease completely. Recovery is often complete in less than seventeen months. Milk preparations are usually harmful to syphilitics, though those with a hot temperament may take freshly soured cow's milk in the hot weather. It is very beneficial to include garlic, leeks, and onions in the diet. But I think that all this requires further investigation. Often the treatment of leprosy is successful in this disease too. Fats and light meats here do no great harm. The flesh of young pigeons and such like is very good. The flesh of hedgehogs and weasels acts, as a medicine in this disease. In short on these lines the health can be rectified and maintained until the crisis is complete. Then the ointments that are mentioned for *àbileh-i-farang* should be used according to the directions there until perfect health is restored. And this is the best method of treatment. But if the disease gets the upper hand and in the period that I have described there is no amelioration and the first methods of treatment are useless or unobtainable, there is no hope for it but to rub in ointments until there is some improvement and I know that this is the best line of treatment. The spots dry up and fall off and the pain becomes less. Then is the time to try other methods of treatment. But if the materies morbi again rebels, the established line of treatment should be again resorted to after a month or two until the time of the crisis arrives. The way to use the ointment is to rub it into all the joints. Then put many garments on to the patient to cause sweating. During the sweat instead of water and food in order to drive out the heat and to strengthen him let the patient take sandal wood, rose water, and basil seeds with sugar candy or distillate of willow and fleawort seeds. If he is weak it is permissible to take a little soup as well. And after the sweat is finished he should take strengthening foods. And on the third day one administers manna and senna with cods of cassia as already described. This produces a good action of the bowel. And there is hope of a complete restoration to health if after the purging (due to the laxatives) blood is let. If the matter of the blood is repeatedly defiled, when it gets to excess it should be remedied by bezoar stone ground up in sour milk solution or by zedoary or draughts of syrup of pounded quince. And as long as complete elimination is not effected, so long the cleansing process is not complete. If the bowels do not work again, the treatment should be repeated after the well known number of days are passed. Another sign that after the administration of the medicaments announces the return of complete health is the breaking out of an eruption within the mouth so that the tongue swells and speech and eating become impossible. Occasionally the purges are vomited but this is not a good sign. Occasionally there is bleeding from the nose without any cerebral injury. And this is a hopeful sign also.

The large cephalic pill is prepared from nightshade berry juice, fresh coriander, vinegar, syrup of sandal wood, and rose water. It is to be smelled and used as an mouthwash. * * * * * [?] drinks soup suitable to him. And after purges have been administered, if the chancre remains unhealed, the ointments that are employed for blisters and anthrax must be used. I personally am in the habit of giving to phlegmonous constitutions a purge, of [?] two or three times a month with good results. And for some of my patients after the purgation I have ordered a course of the mercury elixir and they were cured. I have met some physicians who first prescribe the ointments employed in small-pox and then order three days and three nights of sweating. And during this period once a day they give light and nourishing broths and once the mixtures I have described. And then they give laxatives. But this is not without danger. For since this disease is a chronic one, gentleness and patience and nursing the strength and repeated clysters and abstention are essential.

THE MERCURY ELIXIR: Take ten drachms of mercury, five drachms of the "Potent Powders," two drachms of each of henna, pepper and ginger. Powder them up and put them through a sieve. Deaden the mercury with these and prepare the elixir with honey and syrup of lemons. Dose: the size of pea.

THE POTENT POWDER: Grind up, put through a sieve, and carefully store cinnamon, fennel, lentiscus in equal parts. This is all that Baha'-ul-Dovleh says about it. But I maintain that this is a well known and proved pill which is used in Constantinople, Europe, India and other places. If required as an elixir it can also be made into one. And in my opinion if made with oils and employed as an ointment the gain is greater and the advantages more general and by the will of God it will be entirely free from danger.

Take mercury, bdellium, tragacanth, gum Arabic, starch, Chinese rhubarb, convolvulus, agaricum, saffron, henna leaves, sarcocolla, camphor, lentiscus, zedoary, kernels of pistachio nuts and almonds, and scammony. In the prescription the amounts are not stated. But if rhubarb, agaricum, and convolvulus are not included in the ointment but are replaced by certain suitable, strengthening drugs, the result will be better and more suitable. A well known much tried ointment is this. Take three drachms of incense, lentiscus, black aloes, fenugrec, scoria, saltpeter and gunpowder, ten drachms of henna and ten of mercury and ten of verdigris, ten ounces of oil and ghee, and twelve of fat. With them prepare a pomade. And I claim that wherever smallpox is ulcerative and the ulcers become indolent, this pomade is very useful.

A well tried ointment, not without its uses and better than many of its predecessors. Take Chinese chelidonium, mineral mummy, liquid styrax, incense, tutty of Kerman, henna leaves, colchicum, congealed fat, sulphide of mercury, white vitriol, ammoniacum, tragacanth, lentiscus, Armenian bole, Socotran aloes, verdigris, molybdenum, mercury, black goat's fat, violet root, orange peel, extract of red rose, ox' thigh marrow, olive oil, camphorated wax, and infusion of lemons. [It is obvious I suppose, that violet roots and orange peel are included to prevent any bad smell.] The oily extracts are very few compared to the drugs. If the quantity of some of the drugs is diminished or that of some of the oils increased, the result will be better. And it is clear that this is a prescription for *átis̲h̲ak* in the ulcerative stage. It should be rubbed on to the seat of the ulcer and on to other parts of the body too, and God knoweth best.

Conclusion: Concerning an ointment that is very good for scabies.

Be it known that this ointment is exceedingly effective and profitable for scabies. And seeing that scabies is very close and similar to *Atis̲h̲ak*, this pamphlet is further adorned with this prescription. In the first place the collector and composer of the drugs of this ointment is one Siyyár Bin Músá̲ Harrání, the man of healing, who writes:

"I swear by my life that I have tried this ointment, which is a new one, and have used it for a long time. And I have seen nothing but good results from it."

Anyhow it is in use now and this is the prescription. Take struthium, *bulayya* roots, distillate of the pomegranate bush, distillate of nightshade, distillate of wild sorrel, roast myrobolan, rhubarb seeds, oleander leaves, mercury deadened with ashes of ammonia or of [?], extract of cadmia, silver, solid styrax, fresh fenugrec, ammonia, pyrethrum, assafetida root, both roast. Grind them all together and after adding the deadened mercury make them adhere together by pitch. Spread it out in an earthware vessel and fasten a porcelain lid over it and put it in an oven that it may get warm during the night. Leave it all night and in the morning let it cool down. Then extract the medicament, when it should be black like coal. And if it is not, repeat the process. Next grind it up and mix one part of this to four parts of the other. Grind the whole thing up with extract of roses and mix in some vinegar. Then anoint one organ and let it dry and then another until all are done. The inunction should be performed for several mornings. Then wait a while and give another inunction. But I would have you notice that when no effect has been produced upon this black bilious disease by other drugs, one has recourse to mercury to drive out the matter of the disease. But since in mercury lies a concealed danger, in the treatment of *átis̲h̲ak* corrective drugs are added. And the action of the drugs employed in this disease is just the same as in *átis̲h̲ak*. And by chance all men of learning and experience agree on this point.

Here endeth the Pamphlet.

It has been written by the hands of 'Alí Reza Bin Ḥassan Bin Mascúd, the physician, who is nephew to the author, on the last day of Jamadi-ul-Awwal in the year 1037 (*or marginal reading* 984) (=1627 A.D. or 1576 A.D.). And the date of its completion by the hand of the master Ibn Mascúd Bin Maḥmúd, Maḥmúd the physician; (God grant him salvation on the last day and increase his life until the end of the world) is the second Thursday of Rabbi-ul-Awwal (*or marginal reading* Ṣáni) in the year 977 (=1569 A.D.).

And so praise be to God, first and last, outwardly and inwardly. And upon Maḥomed and his family be praise.

THE BICENTENARY OF

ERASMUS DARWIN AND HIS RELATION TO THE DOCTRINE OF EVOLUTION*

By E. B. KRUMBHAAR, M.D.

PHILADELPHIA

ERASMUS DARWIN, the bicentenary of whose birth we celebrate, has a threefold interest for the historically minded physician: First as grandfather of the more famous Charles, *avus sapiens nepotis magis sapientis* (to paraphrase Horace); next as one of his most important forerunners in groping toward the full-fledged theory of evolution and third as a poet and physician, the first since Lucretius to express noteworthy scientific views with poetry as a medium.

Born at Elston Hall, Nottinghamshire, December 12, 1731 (of a Lincolnshire family that descended from William Darwin of Stuart times) Erasmus was the fourth and youngest son, and was named after his great great grandfather, Erasmus Earle. He studied medicine at Cambridge, having an Exeter scholarship at St. Johns. During one term he left Cambridge to attend Hunter's lectures in London. At Edinburgh he was steeped in the rather arid doctrines of Boerhaave. One likes to speculate as to which of our American physicians he met and knew, as our custom of "finishing off" at Edinburgh was then in full swing. He started practicing at Nottingham in 1755; but, meeting with but little success, moved the next year to Lichfield, where he not only amassed a large practice but followed the physician's surest way of establishing the family fortune by marrying a rich wife. By precept and example, he was successful in a bibulous age in diminishing the drunkenness of the neighborhood, stimulated thereto by an early attack of the gout to which his family was disposed. Temperance ran in the family as seen in this rather curious addition to the family litany:

> From a morning that doth shine,
> From a boy that drinketh wine,
> From a wife that talketh Latine,
> Good Lord deliver me.

Learning, also, was to be found on both sides, barristers and antiquaries, even his mother had a great reputation for learning, hence perhaps the third line of the litany. Small wonder that one of his grandsons, Galton, should be inspired to enquire into the laws and consequences of Hereditary Genius, while another, the greatest exponent of Evolution, deservedly stands as one of England's greatest scientists; not a few others of lesser merit are to be found in the family tree.

Personally, Erasmus early became large and unwieldly and his portrait by Wright of Derby gives the appearance of the typical well-fed, 18th century Englishman. He limped through his latter life, following a fracture of the patella when he was pitched out of a carriage of his own invention. Miss Seward, who there is reason to believe entertained some spiteful feelings to the re-married widower, said that he was marred by smallpox and looked twice his age. "Conscious of great native elevation above the general stand of intellect he became early in life sore upon opposition, whether in argument or conduct." But how many of us become "sore upon opposition" and strive unconsciously for "colloquial despotism" (another of her phrases)? Miss Seward likewise considered him extremely sceptical, depending but little in his practice on the patient's own history of his case; but his grandson quotes many friends who extol his sympathy and benevolence. This did not hinder a certain irascibility or ability to make himself disagreeable if the occasion warranted. A marked stammerer, he nevertheless spoke well in public, and on one occasion of "vinous exhilaration" it was noted that his stammer completely left him. This followed a picnic party on the Trent, when he suddenly dove overboard with his clothes on, swam ashore, walked to nearby Nottingham and was later found, mounted on a tub, haranguing the public with an excellent address on the need for fresh air and other sanitary arrangements in the home.

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* Read before the American Association of the History of Medicine, Atlantic City, May 4, 1931.

FIG. I. PORTRAIT OF ERASMUS DARWIN BY WRIGHT OF DERBY.

His grandson Charles considered him "remarkably free from vanity, conceit or display" and he was kind and considerate to the poor. Unlike this grandson, he had great intellectual vigor, hence part of Drinkwater's literary criticism, "supreme master of misdirected energy," and he preached action rather than speculation. A radical in his views, it was perhaps natural that he should be accused of atheism, though throughout his works are evidences of his belief in God, sometimes paraphrased as a First Cause, as the Creator of the Universe. One of the chapters in "Zoonomia" ends with the words of the Psalmist: "The heavens declare the Glory of God and the firmament showeth his handiwork."

If we agree with Charles Darwin that "there is perhaps no safer test of a man's real character than of his long continued friendship with good and able men," Erasmus' character must be highly valued. His friendship with Josiah Wedgwood is one of the most firmly established points in his career; the Galtons too; and of Keir, Day, Small, Bolton, Watt, Wedgwood and Darwin, Edgeworth says "their mutual intimacy has never been broken except by death." Their "lunar meetings" were famous in their day. With Rousseau, whom he met while botanizing at Wooton Hall, he carried on a correspondence. Samuel Johnson, as one would expect at Lichfield, he had met a few times; but their dominating natures were incompatible and neither had a good word for the other.

Darwin's more strictly medical views are not without interest; he recognized the importance of inherited disease,* foresaw the advantages of microscopic researches (cf. p. 11), advocated less restraint in the treatment of the insane and recognized that dilated cutaneous vessels, paralyzed by heat, may greatly lower the body temperature. Following Lady Montague's smallpox inoculations, he tried the preventive inoculation of measles on two of his children, but they both got the disease so severely that he abandoned the practice. His farsighted views in Phytologia on the biologic control of harmful insects by propagating their greatest enemies and by other means have been very recently alluded to by W. A. Riley[8] who considers him an important "forerunner of modern economic entomologists."

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* Temple of Nature, 1803, p. 45.

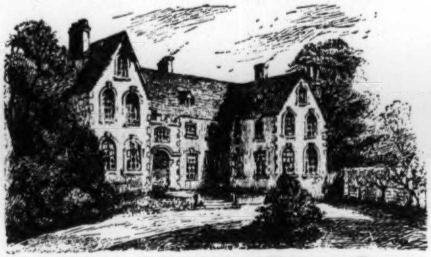
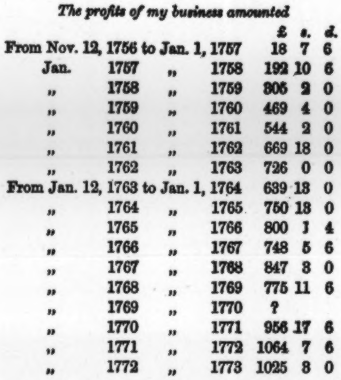


FIG. 2. ELSTON HALL (WHERE ERASMUS DARWIN WAS BORN), AS IT EXISTED BEFORE 1754.

Transfusion of blood for the treatment of anemia came near being resurrected by Erasmus Darwin, as the following abstract from Seward shows:

> One evening, after a long and intense reverie, he said, . . . (to an anemic patient seeking his help) "Lady Northesk, an art was practised in former years, which the medical world has very long disused; that of injecting blood into the veins by a syringe, and thus repairing the waste of diseases like yours. Human blood, and that of calves and sheep, were used promiscuously. Superstition attached impiety to the practice. It was put a stop to in England by a bull of excommunication from some of our Popish Princes, against the practitioners of sanguinary injection . . . That it had been practised with success, we may, from this interdiction, fairly conclude; else restraint upon its continuance must have been superfluous. We have a very ingenious watch-maker here, whom I think I could instruct to form a proper instrument for the purpose, if you choose to submit to the experiment." . . . She replied cheerfully, "that she had not the least objection, if he thought it eligible."



The profits of my business amounted

				£	s.	d.
From Nov. 12,	1756	to Jan. 1,	1757	18	7	6
Jan.	1757	„	1758	192	10	6
„	1758	„	1759	806	2	0
„	1759	„	1760	469	4	0
„	1760	„	1761	544	2	0
„	1761	„	1762	669	18	0
„	1762	„	1763	726	0	0
From Jan. 12,	1763	to Jan. 1,	1764	639	18	0
„	1764	„	1765	750	18	0
„	1765	„	1766	800	1	4
„	1766	„	1767	748	5	6
„	1767	„	1768	847	8	0
„	1768	„	1769	775	11	6
„	1769	„	1770	?		
„	1770	„	1771	956	17	6
„	1771	„	1772	1064	7	6
„	1772	„	1773	1025	8	0

FIG. 3. A LIST OF DARWIN'S MEDICAL INCOME FROM 1756 TO 1773.

Miss Seward then said:

> If the trial should be determined upon, perhaps Lady Northesk would prefer a supply from an healthy human subject, rather than from an animal. My health is perfect, neither am I conscious of any lurking disease, hereditary or accidental. I have no dread of the lancet, and will gladly spare, from time to time, such a portion from my veins to Lady Northesk, as Dr. Darwin shall think proper to inject.

He did not choose, however, to stake his reputation on the risk and fortunately cured the lady with a diet of milk, vegetables and fruit.

In December 1757, Darwin married Mary Howard, aged seventeen, with whom he lived happily till her death in 1770. By her he had three children, of whom the eldest and most promising, Charles, committed suicide during an attack of melancholia. The second, Robert, a successful practitioner at Shrewsbury, married Wedgwood's daughter and was the father of the immortal, Charles. Through Violetta, the eldest daughter of his second wife, he became the grandfather of Francis Galton. Eleven years later he married the widow of Col. Chandos Pole of Radburn Hall to which he shortly moved, as he disliked Lichfield. After two years he moved to Derby and finally to Breadsall Priory, where he died in 1802. Partly recovered from a minor illness, he was seized with a shivering fit, lay faint and cold and died painlessly within two hours of an affection of the heart, according to his doctor son Robert. Although an autopsy was performed, no particulars are now available. He was buried in Breadsall Church with the following epitaph:

ERASMUS DARWIN, M.D., F.R.S.
Born at Elston, near Newark, 12th Dec.
1731.
Died at the Priory, near Derby, 10th
April, 1802.
Of the rare union of Talents
which so eminently distinguished him
as a Physician, a Poet and Philosopher
His writings remain
a public and unfading testimony.
His widow
has erected this monument
in memory of
the zealous benevolence of his disposition,
the active humanity of his conduct,
and the many private virtues
which adorned his character.

Darwin's first important poetic work, the "Botanic Garden," was inspired by certain verses of Miss Seward's, who afterwards (1804) published Memoirs of his life. Darwin, having purchased and adorned a "little, wild, umbrageous valley" about a mile from Lichfield, invited his friend to view the finished work. Her poetic effusion (later published anonymously with alterations by Darwin) in the usual 18th century manner suggested to him that as "the Linnean [sic] System is unexplored poetic ground and an happy subject for the Muse," she should write an allegorical botanical poem, reversing the method of Ovid's "Metamorphoses," to which he would write the scientific notes. When she objected that "the plan was not strictly proper for a female pen," his fears of damaging his professional work with poetry were overridden and he commenced his work. Pursued during "the short recess of professional attendance, but chiefly in his chaise" as he travelled from one patient to another, with care polishing and repolishing the copious scientific notes, it took ten years for its completion. It is over 4000 lines long in decasyllabic rhymed couplets and the notes more than twice as long again. It is in the notes that practically all the items of scientific importance are to be found.

In his introduction and apology, the author says:

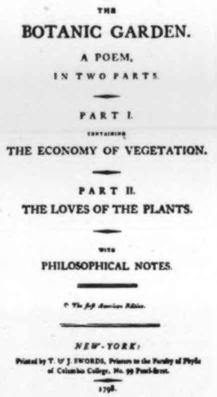
> The general design of the following sheets is to inlist [sic] Imagination under the banner of Science; and to lead her votaries from the looser analogies which dress out the imagery of poetry, to the stricter ones, which form the ratiocination of philosophy . . . It may be proper here to apologize for many of the subsequent conjectures on some articles of natural philosophy, as not being supported by accurate investigation or conclusive experiments. Extravagant theories, however, in those parts of philosophy,

where our knowledge is yet imperfect, are not without their use; as they encourage the execution of laborious experiments, or the investigation of ingenious deductions, to confirm or refute them.

As Drinkwater, who considered Darwin's work worth reading completely through as the best bad poem in the English language, says, "Whatever may be said for or against the principle, never was design more fatally carried out. Minutely specific knowledge combines with an orgy of stilted and inflated abstraction to make the poem pretty nearly everything that poetry should not be." Darwin's biographer in the "Encyclopedia Britannica" considers that "its merits lie in the genuine scientific enthusiasm and interest in Nature which pervade it and of any other poetic quality (except a certain, sometimes felicitous but oftener ill-placed elaborate pomp of words) it may without injustice be said to be almost destitute." Yet, as with Wagner's "Ring," though surely in different proportions, much true poetry and real beauty can be found scattered through the barren wastes, of stilted pseudo science and absurd juxtapositions and at least, as Leslie Stephens says, it is "remarkable that Darwin's poetry everywhere shows a powerful mind."

I have abstracted the first part of the "Botanic Garden"—the "Economy of Vegetation"—and included some quotations, to illustrate some of its qualities—good and bad. In a note to verse 101 of the First Canto is to be found an early exposition of his ideas on evolution. He says:

> *From having observed the gradual evolution of the young animal or plant from its egg or seed; and afterwards its successive advances to its more perfect state, or maturity; philosophers of all ages seem to have imagined that the great world itself had likewise its infancy and its gradual progress to maturity; this seems to have given origin to the very ancient and sublime allegory of Eros, or Divine love, producing the world from the egg of Night, as it floated in chaos.*



THE
BOTANIC GARDEN.
A POEM,
IN TWO PARTS.

PART I.
CONTAINING
THE ECONOMY OF VEGETATION.

PART II.
THE LOVES OF THE PLANTS.

WITH
PHILOSOPHICAL NOTES.

The first American Edition.

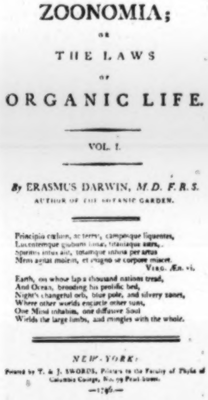
NEW-YORK:
Printed by T. & J. SWORDS, Printers to the Faculty of Physic
of Columbia College, No. 99 Pearl-Street.
1798.

FIG. 4. TITLE-PAGE OF THE FIRST AMERICAN EDITION OF THE BOTANIC GARDEN.

In the "Economy of Vegetation," the Goddess of Botany, welcomed by Nature, allots various tasks to the 4 elements, allegorized as female Gnomes, Water Nymphs, Sylphs and Nymphs of Fire. The last-named, controllers of useful fire, are the primal instructors of savage man; the patronesses of chemistry, teaching the uses of gunpowder and inspiring the invention of the steam engine, with an 18th century anticipation of locomotives, steamships and dirigibles. Electricity next is reviewed: the sensations of an electrified circle of devotees and also its uses in restoring the paralyzed:

Palsy's cold hands the fierce concussion own,
And Life clings trembling on her tottering throne.

The fairy rings, thought to be caused by the effect of lightning on the grass and oaks blighted by lightning are compared in this heterogeneous jumble with the fatal results of Professor Richman's electrical experiments. Franklin and his lightning rods are likened to Cupid snatching Jove's thunderbolts:


ZOONOMIA;
OR
THE LAWS
OF
ORGANIC LIFE.

VOL. I.

By ERASMUS DARWIN, M.D. F.R.S.
AUTHOR OF THE BOTANIC GARDEN.

Principio cœlum, ac terras, camposque liquentes,
Lucentemque globum lunæ, titaniaque astra,
Spiritus intus alit, totamque infusa per artus
Mens agitat molem, et magno se corpore miscet.
VIRG. Æn. vi.

Earth, on whose lap a thousand nations tread,
And Ocean, brooding his prolific bed,
Night's changeful orb, blue pole, and silvery zones,
Where other worlds encircle other suns,
One Mind inhabits, one diffusive Soul
Wields the large limbs, and mingles with the whole.

NEW-YORK:
Printed by T. & J. SWORDS, Printers to the Faculty of Physic of
Columbia College, No. 99 Pearl-street.
—1796.—

FIG. 5. TITLE-PAGE OF AN AMERICAN EDITION OF ZOONOMIA.

Thus when, on wanton wing, intrepid Love
Snatch'd the rais'd lightning from the arm
of Jove,
Quick o'er his knee the triple bolt he bent,
The cluster'd darts and forky arrows rent;
Snapp'd, with illumin'd hands each flaming
shaft,
His tingling fingers shook, and stamp'd, and
laugh'd.
Bright o'er the floor the scatter'd fragments
blaz'd,
And Gods, retreating, trembled as they gaz'd.
Th' immortal Sire, indulgent to his child,
Bow'd his ambrosial locks, and Heav'n
relenting, smil'd.

On the theory that phosphorus colors and warms the blood, the nymphs are described as affecting the animal circulation. Their task—to wring the rain drops from the fiend of frost, and send forth electricity from the depths of the earth, to thaw the sap of plants and trees, to quit the torrid regions when the dog-star presides, to float the icebergs southward to be melted in the warmer currents.

In the Second Canto the Gnomes are viewed as the spirits ministering to the underworld, and concerned with the astronomic wonders of creation: The formation of the earth from the crater of the sun; volcanos, earthquakes, the formation of continents, seas and mountains and of the moon by an explosion of the earth (near the South pole!). As the Gnomes helped in the formation of stone and marbles, sculpture is passed in review. In the extraction of salines, a Punchinello scene is evoked where "azotic gas" becomes the lover of the virgin air with fire as the jealous rival. The mention of iron (produced by the decomposition of vegetable bodies (!)) brings us to the forge of Vulcan and a fine apostrophe of steel:

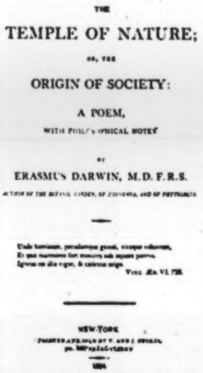
Hail adamantine Steel! magnetic Lord,
King of the prow, the ploughshare, and the
sword!
True to the pole, by thee the pilot guides
His steady course amid the struggling tides!
Braves with broad sail, th' immeasurable sea,
Cleaves the dark air, and asks no star but
thee!

Gems (formed from mixture of marine acids with shells and various earths), Chinese porcelains and those of the author's friend Wedgewood (from volcanic clay) coal, jet, amber (the source of electricity, which through its connection with Franklin and thus with American independence, suffices to introduce the French Revolution and the short-lived freedom of Ireland), silver, gold (here the horrors of the slave-trade)—all are in the Gnomes' domain, who likewise guide the stars in their courses (description of an orrery), stimulate fertility in animals and plants, and decompose living matter (the allegory of Adonis).

The Water Nymphs of Canto 3 must help form and protect the vegetable world, operate the mill and propel the barge. To them the birth of rivers from Alpine snows; to them control of the sea (including the then recent suggestion of oil to smooth the troubled waters); to them charge of the nuptials of "pure air" and inflammable gas—here allegorized into a lengthy extravaganza of Jove's nuptials with Juno. For the early death of Brindley, the father of commercial canals, nymphs "shower'd th' incessant tear," a lament to be shortly followed by what today at least seems a grotesque contrast—a description of the mechanism of the common garden pump. The use of water by the fire-engine, on the other hand, invokes lines reminiscent of the Great Fire of London of the previous century, lines whose force of expression and vividness of description leave no doubt as to the poet's capacity.

From dome to dome when flames infuriate climb,
Sweep the long street, invest the tower sublime;
Gild the tall vanes amid th' astonish'd night,
And reddening heaven returns the sanguine light;
While, with vast strides and bristling hair, aloof
Pale Danger glides along the falling roof;
And giant Terror, howling in amaze,
Moves his dark limbs across the lurid blaze;
Nymphs, you first taught the gelid waves to rise,
Hurl'd in resplendent arches to the skies;
In iron cells condens'd the airy spring,
And imp'd the torrent with unfailing wing;
On the fierce flame the shower impetuous falls,
And sudden darkness shrouds the shatter'd walls;
Steam, smoke, and dust, in blended volumes roll,
And Night and Silence repossess the pole.

The duties of the Water Nymphs in watering the roots of plants and flowers serve for a comparison with the course of the chyle through the human body, while their ministrations to the parched traveller is exemplified in a Moslem pilgrimage across the desert to Mecca.



THE
TEMPLE OF NATURE;
OR, THE
ORIGIN OF SOCIETY:
A POEM,
WITH PHILOSOPHICAL NOTES
BY
ERASMUS DARWIN, M.D. F.R.S.

NEW-YORK

FIG. 6. TITLE-PAGE OF AN AMERICAN EDITION OF THE TEMPLE OF NATURE.

To the Sylphs of the Fourth Canto falls the duty of protecting the emergent vegetation. They must arrest the devastating simoon, "pierce the drowsy Fog," combat contagion and guide the study of the air. Here Torricelli, Boyle and Priestley share the stage with young Rossière, then recently "precipitated from his flaming montgolfier," a certain shipwrecked Capt. Pierce and family, and Day and Spalding, unfortunate pioneers in diving bells. The Sylphs are commanded to raise an altar to Hygiea, summon the Fire-vestals, Gnomes and Nymphs and all join the Queen of Botany in a patriotic apostrophe to the Goddess of Health.

In the Loves of the Plants, which, though a Second Part, was published in 1789, two years before the complete work, the author has detailed the amorous adventures of some hundred personified plants based on the Linnean system: "The classes are distinguished from each other by this ingenious system, by the number, situation, adhesion or receipt, proportion of the males in each flower. The orders in many of these classes are distinguished by the number or other circumstances of the females." In this whimisical arrangement the number of "males" signifies the number of stamens per flower; of females, the pistils. Its absurdities opened the way to an equally well known parody by Canning—"The Loves of the Triangles," which appeared in the *Anti-Jacobin*. A sample of its language seems hardly more preposterous than parts of its prototype:

FIG. 7. BREADSALL PRIORY, WHERE ERASMUS DARWIN DIED.

> With lucid language, and most dark designs,
> In sweet tetrandryan, monogynian strains
> Part for a pistil in botanic pains;
> Raise lust in pinks and with unhallowed fire,
> Bid the soft virgin violet expire.

Darwin's Ideas on Evolution. Though Darwin's grandson Charles rather summarily dismisses his grandfather's position on Evolution merely as anticipating "the views and erroneous grounds of opinions of Lamarck"*—perhaps on account of his well-known dislike for that scientist—it cannot be denied that Erasmus had a clearer concept, though largely unsupported by evidence, than any of his, and in some ways of his grandson's, predecessors. We have already noticed the footnote in the "Economy of Vegetation" and his ideas on the gradual progress of the world from infancy to maturity. Believing that the lime of the earth came entirely from living creatures—pardonable perhaps in the then state of chemical knowledge—he is said to have altered the motto to his family coat-of-arms, which bore three scallop shells, to *E conchis omnia*.

The importance of *vestigial structures* as evidence in support of evolution seems to have been well recognized by Erasmus. Early in the "Economy of Vegetation" he states:

> There are likewise some apparently useless or incomplete appendages to plants and animals which seem to shew they have gradually undergone changes from their original state; such as the stamens without anthers, and styles without stigmas of several plants, as mentioned in the note on Curcuma, vol. II of this work. Such as the halteres, or rudiments of wings of some two-winged insects, and the paps of male animals; thus swine have four toes, but two of them are imperfectly formed, and not long enough for use. [And again] there is a curious circumstance, [he says], belonging to the class of insects which have two wings, or diptera, analogous to the rudiments of stamens above described; viz, two little knobs are found placed each on a stalk or peduncle, generally under a

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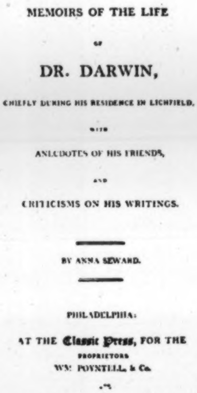
* Lamarck is said by Osborn to be the only writer of whom Charles Darwin ever spoke disdainfully.

little arched scale; which appear to be rudiments of hinder wings; and are called by Linneus halteres, or poisers, a term of his introduction. Other animals have marks of having in a long process of time undergone changes in some parts of their bodies, which may have been effected to accommodate them to new ways of procuring their food. The existence of teats on the breasts of male animals, and which are generally replete with a thin kind of milk at their nativity, is a wonderful instance of this kind. Perhaps all the productions of nature are in their progress to greater perfection?—an idea countenanced by the modern discoveries and deductions concerning the progressive formation of the solid parts of the terraqueous globe, and consonant to the dignity of the Creator of all things.

In his "Zoonomia or the Laws of Organic Life," published in London 1794–1798, his ideas on evolution are even more clearly and extensively expressed. This treatise the "Encyclopedia Britannica" calls a treatise on generation containing a system of pathology,* while the enthusiastic Seward thought that it opened a "new era of pathologic science" and would teach more than the universities or the pages of Galen or Hippocrates. Kraus considers that its fundamental idea is that there is "a living force at work in plants and animals which is enabled spontaneously to adapt them to the circumstances of the outer world." This differs from Buffon's belief (whom Darwin resembled in ascribing importance to the struggle for existence) in that Darwin felt that *modifications due to environment* were due to the changed reactions of the organism and not to the direct physical action. In sketching his views on Evolution, Darwin considers first, the great changes that occur in animals in a single lifetime (tadpole, frog, etc.); second, those that may be produced by cultivation (the bulldog, foxhound, greyhound); third, those that occur before birth (hybrids, monstrosities, breeding for type) together with a statement of *Epigenesis*; fourth, the great similarity even of cold-blooded and warm-blooded animals, and fifth, the perpetual transformation that animals undergo during a single lifetime and here he adheres to the *Inheritance of acquired characteristics*. To do justice to these ideas it is but fair to give his own words, even though the quotation is lengthy:


MEMOIRS OF THE LIFE

OF

DR. DARWIN,

CHIEFLY DURING HIS RESIDENCE IN LICHFIELD.

WITH

ANECDOTES OF HIS FRIENDS,

AND

CRITICISMS ON HIS WRITINGS.

BY ANNA SEWARD.

PHILADELPHIA:

AT THE Classic Press, FOR THE
PROPRIETORS
WM. POYNTELL, & Co.

FIG. 8. TITLE-PAGE OF A PHILADELPHIA EDITION OF ANNA SEWARD'S MEMOIRS.

> When we revolve in our minds, first, the great changes, which we see naturally produced in animals after their nativity, as in the production of the butterfly with painted wings from the crawling caterpillar; or of the respiring frog from the subnatant tadpole; from the feminine boy to the bearded man. . .
>
> Secondly, when we think over the great

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* Here the term is used in as broad a sense as even the most progressive of modern pathologists could demand. In fact a 19th century pathologic anatomist might easily have considered such a use an abuse.

changes introduced into various animals by artificial or accidental cultivation, as in horses, which we have exercised for the different purposes of strength or swiftness, in carrying burthens or in running races; or in dogs, which have been cultivated for strength and courage, as the bull-dog; or for acuteness of his sense of smell, as the hound and spaniel; or for the swiftness of his foot as the greyhound; or for his swimming in the water, or for drawing snow-sledges, the rough-haired dogs of the north; . . . and add to these the great changes of shape and colour, which we daily see produced in smaller animals from our domestication of them, as rabbits, or pidgeons; or from the difference of climates, and even of seasons; thus the sheep of warm climates are covered with hair instead of wool; and the hares and partridges of the latitudes which are long buried in snow, become white during the winter months; add to these the various changes produced in the forms of mankind by their early modes of exertion; or by the diseases occasioned by their habits of life; both of which become hereditary, and that through many generations. Those who labour at the anvil, the oar, or the loom, as well as those who carry sedan-chairs, or those who have been educated to dance upon the rope, are distinguishable by the shape of their limbs . . .

Thirdly, when we enumerate the great changes produced in the species of animals before their nativity; these are such as resemble the form or colour of their parents, which have been altered by the cultivation or accidents above related, and are thus continued to their posterity. Or they are changes produced by the mixture of species, as in mules; or changes produced probably by the exuberance of nourishment supplied to the fetus, as in monstrous births with additional limbs; many of these enormities of shape are propagated, and continued as a variety at least, if not as a new species of animal. I have seen a breed of cats with an additional claw on every foot; of poultry also with an additional claw, and with wings to their feet, and of others without rumps. Mr. Buffon mentions a breed of dogs without tails, which are common at Rome and Naples, which he supposes to have been produced by a custom long established of cutting their tails close off. There are many kinds of pidgeons, admired for their peculiarities, which are monsters thus produced and propagated. . . . When we consider all these changes of animal form, and innumerable others, which may be collected from the books of natural history; we cannot but be convinced, that the fetus or embryon is formed by apposition of new parts, and not by the distention of a primordial nest of germs included one within another like the cups of a conjurer.

Fourthly, when we revolve in our minds the great similarity of structure which obtains in all the warm-blooded animals, as well quadrupeds, birds, and amphibious animals, as in mankind; from the mouse and bat to the elephant and whale; one is led to conclude, that they have alike been produced from a similar living filament. In some this filament in its advance to maturity has acquired hands and fingers, with a fine sense of touch, as in mankind. In others it has acquired claws or talons . . . in others toes with an intervening web, or membrane . . . in others it has acquired cloven hoofs . . . and whole hoofs in others . . .while in the bird kind this original living filament has put forth wings instead of arms or legs, and feathers instead of hair. In some it has protruded horns on the forehead instead of teeth in the fore part of the upper jaw; in others tushes instead of horns; and in others beaks instead of either. And all this exactly is daily seen in the transmutations of the tadpole, which acquires legs and lungs when he wants them; and loses his tail when it is no longer of service to him.

Fifthly, from their first rudiment, or primordium, to the termination of their lives, all animals undergo perpetual transformations, which are in part produced by their own exertions in consequence of their desires and aversions, of their pleasures and pains, or of irritations, or of associations; and many of these acquired forms or propensities are transmitted to their posterity.

As air and water are supplied to animals in sufficient profusion, the three great objects of desire, which have changed the forms of many animals by their exertions to gratify them, are those of lust, hunger, and security. A great want of one part of the animal world has consisted in the desire of the exclusive possession of the females; and these have acquired weapons to combat each other for this purpose, as the very thick, shield-like, horny skin on the shoulder of the boar is a defense only against animals of his own species, who strike obliquely upwards, nor are his tushes for other purposes, except to defend himself, as he is not naturally a carnivorous animal. So the horns of the stag are sharp to offend his adversary, but are branched for the purpose of parrying or receiving the thrusts of horns similar to his own, and have, therefore, been formed for the purpose of combating other stags for the exclusive possession of the females; who are observed, like the ladies in the time of chivalry, to attend the car of the victor.

The birds which do not carry food to their young, and do not therefore marry, are armed with spurs for the purpose of fighting for the exclusive possession of the females, as cocks and quails. It is certain that these weapons are not provided for their defence against other adversaries, because the females of these species are without this armour. *The final cause of this contest amongst the males seems to be, that the strongest and most active animal should propagate the species, which should thence become improved.*

Another great want consists in the means of procuring food, which has diversified the forms of all species of animals. Thus the nose of the swine has become hard for the purpose of turning up the soil in search of insects and of roots. The trunk of the elephant is an elongation of the nose for the purpose of pulling down the branches of trees for his food, and for taking up water without bending his knees. Beasts of prey have acquired strong jaws or talons. Cattle have acquired a rough tongue and a rough palate to pull off the blades of grass . . . Some birds have acquired harder beaks to crack nuts, as the parrot. Others have acquired beaks adapted to break the harder seeds, as sparrows. Others for the softer seeds of flowers, or the buds of trees, as the finches. Other birds have acquired long beaks to penetrate the moister soils in search of insects or roots, as woodcocks, and others broad ones to filtrate the water of lakes, and to retain aquatic insects. *All of which seem to have been gradually produced during many generations by the perpetual endeavour of the creatures to supply the want of food, and to have been delivered to their posterity with constant improvement of them for the purpose required.*

The third great want among animals is that of security, which seems much to have diversified the forms of their bodies and the colour of them; these consist in the means of escaping other animals more powerful than themselves. Hence some animals have acquired wings instead of legs, as the smaller birds, for the purpose of escape; others great length of fin or of membrane, as the flying fish, and the bat. Others great swiftness of foot as the hare. Others have acquired hard or armed shells, as the tortoise and the echinus marinus.

The contrivances for the purposes of security extend even to vegetables, as is seen in the wonderful and various means of their concealing or defending their honey from insects, and their seeds from birds. On the other hand, swiftness of wing has been acquired by hawks and swallows to pursue their prey; and a proboscis of admirable structure has been acquired by the bee, the moth, and the humming bird, for the purpose of plundering the nectaries of flowers. All which seem to have been formed by the original living filament, excited into action by the necessities of the creatures, which possess them, and on which their existence depends.

From thus meditating on the great similarity of the structure of the warm-blooded animals, and at the same time of the great changes they undergo both before and after their nativity; and by considering in how minute a portion of time many of the changes of animals above described have been produced; would it be too bold to imagine, that in the great length of time, since the earth began to exist, perhaps millions of ages before the commencement of the history of mankind, would it be too bold to imagine, that all warm-blooded animals have arisen from one living filament which *the great first cause* endued with animality, with the power of acquiring new parts, attended with new propensities, directed by irritations, sensations, volitions, and associations; and thus possessing the faculty of continuing to improve by its own inherent activity, and of delivering down those improvements by generation to its posterity, world without end!

Thus we see that he appreciated and gave expression to the theory of *Epigenesis* and to the idea of *Sexual Selection* in propagating and improving the species, and had noted various *food-obtaining* and *security contrivances* both in animals and plants which promoted their chances of survival. In the 39th section of "Zoonomia" he has several paragraphs on *protective coloration* of plants, and animals' eggs and bodies (the white winter coat of snow-animals included) which have an altogether modern ring. He recognizes the similarity of vegetable and animal life and conjectures a common cause: "as the earth and ocean were probably peopled with vegetable productions long before the existence of animals; and many families of these animals long before other families of them, shall we conjecture that one and the same kind of living filaments is and has been the cause of all organic life?" This he logically pursues to *spontaneous generation* of the first and lowliest forms:

Hence without parent by spontaneous birth
Rise the first specks of animated earth

a theory which even today has a weightier backing than the earlier begging-the-question that life had been carried here from other stars. Erasmus, to be sure, proceeded to weaken his position by giving examples of present-day spontaneous generation, which have been buried since the historic work of Pasteur.

The preformation theory, which still held ground in spite of the evidence of Harvey and others in favor of Epigenesis, was cleverly disposed of by Erasmus in the following words:

> Many ingenious philosophers have found so great difficulty in conceiving the manner of reproduction in animals, that they have supposed all the numerous progeny to have existed in miniature in the animal originally created. This idea, besides its being unsupported by any analogy we are acquainted with, ascribes a greater continuity to organised matter than we can readily admit. These embryons . . . must possess a greater degree of minuteness than that which was ascribed to the devils who tempted St. Anthony, of whom twenty thousand were said to have been able to dance a saraband on the point of a needle without the least incommoding each other.

In discussing the *origin of man* in notes in the "Temple of Nature," he recognizes various anatomical arrangements that indicate a former horizontal posture, and considers with Buffon and others that mankind may have arisen from one family of monkeys "who accidentally had learned to use the adductor pollicis," an idea that still holds its own in a hotly contested field. Then he proceeds to alienate our support by asserting that this family lived in a precise spot on the south shore of the Mediterranean.

The *struggle for existence* is recognized in various parts of his writings, perhaps best in "Phytologia" (XIX, 7). If he had only recognized with Malthus the effect that this has on the character and amount of survival, then natural selection, the keystone of his grandson's arch, would have been added to him.

Compared with his more famous contemporary Lamarck, it is clear that Darwin anticipated most if not all of Lamarck's well known four laws (1, internal force tending to increase body volume; 2, production of a new part as a result of need; 3, direct relation of development of a part to its employment; 4, transmission of acquired characteristics). How much or how little Lamarck owed to Darwin is a point on which opinions differ.*

Concepts verging on Evolution had occupied the attention of philosophers since the days of Anaximander and Empedocles. It should probably not be held that Erasmus Darwin produced any new idea on the subject of Evolution that was of prime importance or gave important deflections to the gradually increasing stream of evolutionary knowledge. Nevertheless, just as his grandson Charles is entitled to the highest credit even though doubtless evolution would have not been long in receiving adequate expression without him, so Erasmus must receive his due for getting to most of the roots of the matter and giving the clearest expression of the subject up to his time. But perhaps we had better conclude, as does Drinkwater, in Erasmus' own words from the "Botanic Garden": "Such as it is . . . desire the ladies and gentlemen to evaluate, but please to apprize them that like the spectators at an unskilful exhibition in some village barn I hope they will make good humor one of their party."

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* See H. F. Osborn's from the Greeks to Darwin.

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[From Donzelli: Teatro Farmaceutico, 1677.]

FROM EPIDAUROS TO GALENOS

THE PRINCIPAL CURRENTS OF GREEK MEDICAL THOUGHT*

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LONDON

THE object of this paper is to show the evolution of Greek medical thought from the practices of religious medicine, as symbolized by the Faith-healing of Epidauros, which forms the link with the pre-Hellenic or irrational medicine, to the death of Galenos which marks the end of the creative period of Greek medicine. For the understanding of this important period of the history of medicine, the history of the Greeks, in general, must be taken into consideration; and principally the work of the physiologists and philosophers, who mark the various stations of Greek thought, must be studied. Greek medicine bound with Greek thought, in general, shows a remarkable progression, from the first conceptions of nature, of life, of disease due to the physiologists, philosophers and physicians of the seventh and sixth centuries B.C. to the complete knowledge of physiology found in Galenos.

Medicine is a creation of the Greek intellect. Before the advent of the Greeks the people who had preceded them in the history of the world had an attitude towards disease which did not correspond to real medicine, which is based on science. Medicine before the Greeks was mostly religious, magical, irrational. Epidauros, and in general the cult of Asclepios represents the religious medicine of the Greeks, and constitutes therefore the link that unites the irrational medicine of the ancient Eastern people to the scientific medicine of the Greeks.

In the scientific medicine of the Greeks four periods can be distinguished. Every period is based on physiological work, and it is in part the application of this physiological work to medicine, and its development through special clinical methods of diagnosis and treatment that characterizes the medical work of every period. Physiology, taken in its large sense, that is, including anatomy, is the scientific basis of medicine, and thus the only way to understand the evolution of Greek medical thought will be to place distinctly at the beginning of each period, the physiological work on which this period is based.

The first period can be called the physiological period. The physiological work on which the practice of these early physicians is founded is that of the ancient Ionian philosophers called in Greek Physiologists, such as Thalles of Miletus. To this period of Greek medicine belong the old schools of Magna Graecia, that is of the Greek colonies of the south of Italy and Sicily. During this period the basic concepts of medicine are founded, diagnosis is introduced, on the basis principally of physiological deduction controlled by a rudimentary clinical examination, and treatment begins on the basis of a combination of deductions from physiology and of clinical control. This period comprises the seventh and the sixth centuries and the early fifth century B.C.

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* Paper read before a meeting of the Royal Society of Medicine at the Wellcome Historical Museum, on January 30, 1930. On the occasion of the 18th Centenary of Galenos.

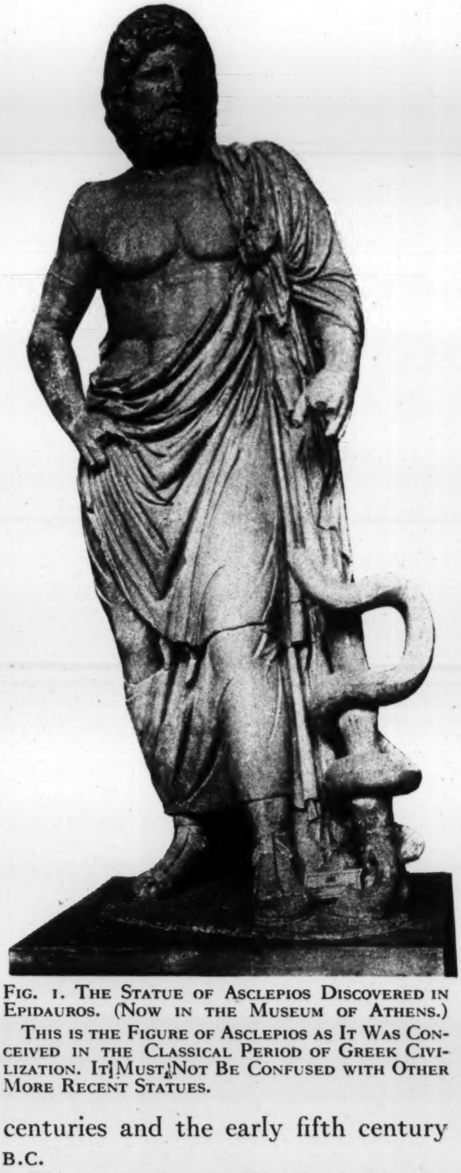

Fig. 1. The Statue of Asclepios Discovered in Epidauros. (Now in the Museum of Athens.)

This is the Figure of Asclepios as It Was Conceived in the Classical Period of Greek Civilization. It Must Not Be Confused with Other More Recent Statues.

The second period begins with the work of the physiologists of the fifth century B.C., Anaxagoras, Democritus and Diogenes of Apollonia, and is represented by the late Italo-Sicilian physicians and the famous schools of Cos and Cnidos. The conception of the mechanism of disease becomes more precise and the clinical method of diagnosis and treatment reaches its zenith, from the combination of the nosographical method introduced by the physicians of Cnidos, and that of the individual diagnosis developed by the physicians of Cos. This period comprises the fifth and the fourth centuries B.C.

The third period receives a great impulse from the physiological work of Aristotle. It is characterized by a tendency to base diagnosis and treatment on rational lines, that is on deductions from physiology. This tendency does not succeed completely, and that is why many physicians remain faithful to the clinical methods of the previous period, while others fall into an exclusively physiological dogmatism, which brings as a reaction, as another dogmatism, the development of the school of the Empirics.

The fourth period is represented by the work of Galenos. He is the physiologist on whom the medical work of the period is based and he is at the same time the physician who applies that medical work. The physiology of Galenos marks a great progress over that of Aristotle and of the Alexandrians, on account of the introduction by Galenos of the experimental method. From a medical point of view this Galenic period is characterized by the predominant rôle the physiological method plays in diagnosis and treatment.

The fifth period is the period of compilation and transmission of Greek medicine to the West.

EPIDAUROS

The study of the principal currents of Greek medical thought begins with Epidauros for two reasons. Epidauros, being the most celebrated shrine of the God of Medicine, of Asclepios, symbolizes Greek medicine. It is in the neighborhood of this famous temple, that according to some beautiful legends, Asclepios was born as son of Apollo the God of Art and of the beautiful Koronis, and it is on the Mount Tithion, that is near the actual sanctuary, that the child Asclepios was kept by a shepherd and nourished with the milk of a goat.

Apart from that, Epidauros is interesting because it is the most important place of Greek faith-healing, and represents a sort of transition between the pre-Hellenic medicine, which was nearly exclusively religious, at all events magical and irrational, and the Greek medicine which was rational and scientific. It may appear curious that in the ultra-rational Greece religious medicine, as has been demonstrated by the work of P. Cawadias, played such a great rôle. But this is easily understood when one remembers the marvelous sense of proportion the ancient Greeks brought into all their work. The Greek physicians knew that the power of mind over body was very great, and they knew also that nothing could have such a power over the mind as religion, and thus they did not do anything to hinder the evolution of religious medicine.

On the other hand the priests of Asclepios realized that there were limits in the action of mind over body, and that their God could not do everything, and they were probably very careful to send to the physicians who had their schools near the temples of Asclepios, the organic cases. As a form of religious medicine Epidauros represents also the Hellenic spirit regarding religion. There were no inscrutable mysteries, no magical procedures, no manifestations of theocracy in the practice of Epidauros. Those who came there were simply put into a good condition, so as to receive the effects of the religious suggestion. They came into a beautiful country, where they forgot all the worries of life, by listening to theatrical representations given in that marvelous theater of Polycletos, which remains today the masterpiece of Greek theatrical architecture. They visited the musical places, watched the athletic games at the Stadium, and conversed about politics or philosophy with the people who had come from all parts of Greece. At the corners of the shady alleys, they could read the steles on which were written the miraculous cures of the God of Medicine.

When they were thus well prepared, they were put to sleep in the Abaton, and the God appeared in their dream acting as a physician, manipulating their diseased limbs, applying an ointment on their sore eyes, and pushing the similarity to the physician so far as to recommend to the patient not to forget to pay his fee to the priests. When the patient awoke, he was cured.

One sees that there was a great difference between the religious medicine of Epidauros and the religious medicine of the Egyptians, the Assyrians, the Babylonians and the Jews. The patients who came to Epidauros were not considered as possessed of gods or demons, but as suffering from disease explained by the laws of physical nature. There was no practice of magic, no manifestations of theocracy, but pure, one could say, rational psychotherapy. There was no exclusiveness, and the collaboration of the scientific physicians was often demanded. The Greeks had in the matter of religion ideas explained in the story of the man who while drowning was invoking Pallas Athene, and to whom one of his companions said, "continue to invoke Athene, but try also to swim." *Σὺν ’Αθηνᾷ μαὶ χείρσ μίνει.*

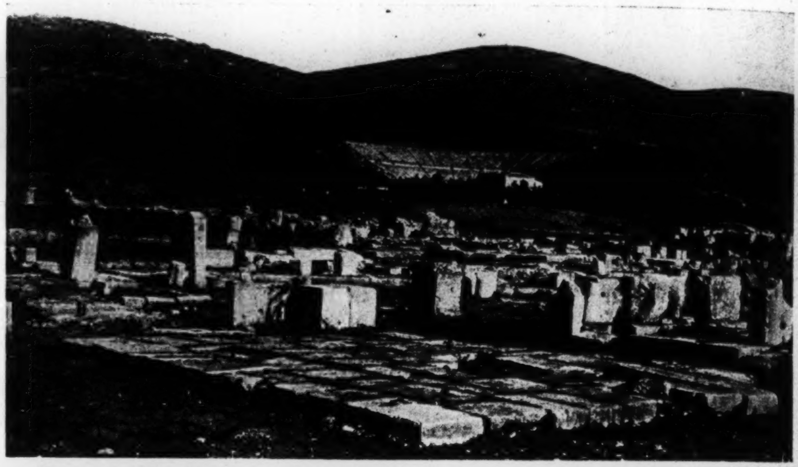

FIG. 2. EPIDAUROS. THE TEMPLE OF ASCLEPIOS WITH THE THEATER OF EPIDAUROS IN THE BACKGROUND. (THIS THEATER BUILT BY POLYCLETOS WAS CONSIDERED BY THE ANCIENT GREEKS AS THE MASTERPIECE OF GREEK THEATRICAL ARCHITECTURE. IT IS THE BEST PRESERVED AND THE MOST MAGNIFICENT GREEK THEATER AND CAN CONTAIN 14,000 SPECTATORS. THE ACOUSTICS ARE SO PERFECT THAT THE SPECTATORS SITTING IN THE LAST (THE 55TH) ROW OF MARBLE SEATS CAN HEAR DISTINCTLY A DIALOGUE TAKING PLACE IN THE ORCHESTRA. (FROM THE 2ND UNPUBLISHED VOLUME OF "FOUILLES D'ÈPIDAUROS" OF P. CAWADIAS.)

FIRST PERIOD OF GREEK MEDICINE (SEVENTH, SIXTH AND EARLY FIFTH CENTURY,

THE FIRST PHYSIOLOGISTS (SEVENTH CENTURY). Scientific medicine begins with the first physiologists who flourished in the beginning of the seventh century. It has been remarked that the Greeks called not those who are designated today with this term, but philosophers trying to unravel the problems of Nature. This distinction is not justified. Of course the Ionian physiologists of the seventh century did not experiment in the actual sense of the word, but it is not experimentation but the critical consideration of facts of observation and experimentation that constitute the science of Physiology. Thus these Greek physiologists were really the first physiologists. They did not study man or animals or plants alone, but all nature, because it was the only method through which the place of man in Nature could be ascertained. Thales of Miletos believed that water was the primary element from which all matter was formed, and Anaximander of Miletos explained the origin of man by various transmutations. It is on the work of these first physiologists that the first phase of Greek medicine is based.

THE MEDICAL SCHOOLS OF CROTON, AND OF SICILY. SIXTH CENTURY. Three names dominate the medical school of Croton, those of Pythagoras, of Alkmeon and of Democedes. They flourished about the sixth century B.C. The School of Agrigentum is represented by Empedocles and by Acron who flourished in the fifth century B.C.

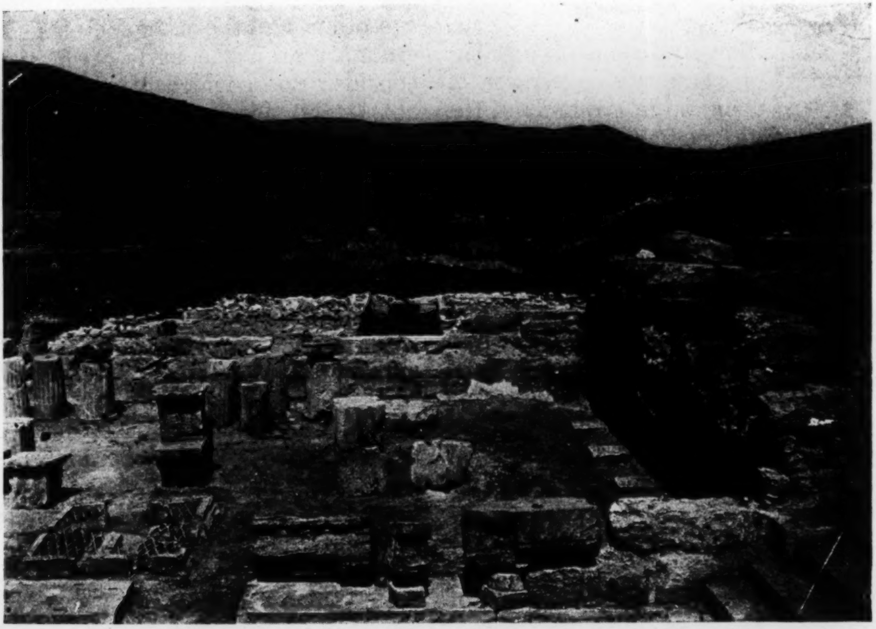

FIG. 3. THE RUINS OF THE ABATON, THE BUILDING IN WHICH THE PATIENTS USED TO SLEEP AND SAW IN THEIR DREAMS THE GOD OF MEDICINE, ASCLEPIOS WHO CURED THEM OF THEIR ILLS. (UNPUBLISHED PHOTOGRAPH FOUND IN THE PAPERS OF THE LATE PROFESSOR P. CAWADIAS.)

With Pythagoras the physiologist becomes a physician, and the doctrines of the first physiologists of Ionia, from which place Pythagoras originated, are transmitted to the Greek colonies of Italy and of Sicily.

Physiology remains the basis of medicine but takes a more precise form. The human body for Alkmeon is constituted of various elements, such as Cold, Damp, Warm, Dry, Bitter, Sweet. Health is the perfect equilibrium the ἰσονομία of these elements. Disease is the rupture of that equilibrium resulting in the preponderance, the μοναρχία of one of them. Today we say that health consists in the perfect equilibrium of the organs of the body, in the perfect correlation of these organs and that disease consists in the disturbance of that equilibrium, the disturbance of that correlation. The terms have changed a little, but the idea remains the same. In medicine as in all other branches of human activity, the ancient Greeks struck at once the right principles.

With Empedocles of Agrigentum this conception is simplified. Instead of the eleven principles of Alkmeon, Empedocles admits only four, Earth, Water, Fire and Air.

> To the elements it came from
> Everything will return,
> Our bodies to earth
> Our blood to water
> Heat to fire
> Breath to air.
>
> MATTHEW ARNOLD: Empedocles on Etna

Apart from this basic conception of disease physiology progresses with the precise work of dissections carried on by Alkmeon and Empedocles.

Diagnosis and treatment were based in great part on physiological considerations, that is on the conception of what was going on in the body of the patient and the treatment of this disturbance, was deduced from physiological knowledge. It must be said at once that this is not absolute and that the Greeks, except during the period of decadence of Greek medicine, never used an exclusively deductive physiological method of diagnosis and of treatment. That the physicians of Croton and of Sicily were at the same time good clinicians, is demonstrated by what we know of the practical clinical work of Democedes, a Crotonian physician of the sixth century B.C. famous for his clinical work in the court of Darius.

The therapeutical procedures of these schools were built on rational and clinical empirical lines. Many of their methods, as for example the dietetic prescriptions of Pythagoras, consisting in the limitation of meat eating and in the avoidance of fish were based on physiological and philosophical conceptions. The clinical control was however very important, and it is to the clinical observations of these physicians on the action of gymnastics and diet in general that is based the introduction of these therapeutical methods. The fact that only a sound physiology, at all events for that epoch, and a precise clinical observation, guided their treatment, is also demonstrated by the absence of drugs in the practice of the first Greek physicians, an absence which was instituted because the use of drugs could not at that time be based on physiological considerations or on the result of precise clinical observations. This contrasts with the enormous quantity of drugs used by the Egyptians and the other ancient Eastern people on the basis of mystical considerations, which of course were absolutely foreign to the Greek physicians.

The addition of empiricism to the high physiological speculations of the Italo-Sicilian physicians is also demonstrated by the preventive medical work of Empedocles, who freed Selenus from a pestilence, probably malaria, by draining swampy lands, and who improved the hygienic conditions of his native town by various works. The clinical empirical method appears even to have been greatly developed among the later representatives of this school. Acron of Agrigentum (fifth century B.C.) taught distinctly that empiricism must be preferred to speculations, and is considered as the originator of the empirical school. According to Plutarch, Acron combated an epidemic by means of funeral pyres.

Thus with the first physicians of the Greek towns of Italy and Sicily the general conception of disease is given, precise physiological work begins, diagnosis is developed on the lines of physiological methods tempered by a rudimentary clinical observation, and treatment develops on the basis of a combination of the rational or physiological method, and of the empirical or clinical method.

SECOND PERIOD OF GREEK MEDICINE (FIFTH AND FOURTH CENTURIES B.C.)

PHILOSOPHER PHYSICIANS OF THE EARLY FIFTH CENTURY. *The First Humorist, Solidistic and Pneumatic Doctrines.* The second phase of Greek medicine is based regarding its physiopathological conceptions on the work of three physiologists (or philosopher physicians) of the early fifth century B.C., Anaxagoras of Klazomene, Democritus of Abdera, Diogenes of Apollonia. This work brings the conception of disease on a more precise basis. Instead of considering in man vague elements, like the Cold, Dry, Damp, Bitter, Sweet of Alkmeon, and the Fire, Earth, Air, Water of Empedocles, they consider elements of more definite constitution, the Air, the Humors, the solid parts. Thus physicians begin, instead of considering the disturbance of the same vague elements, to consider the disturbance of Air, Humors and Atoms or solid particles.

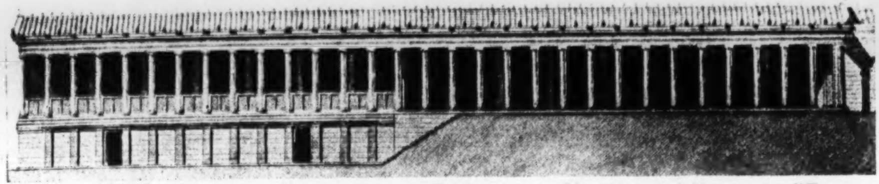

FIG. 4. THE ABATON AS IT WAS IN ANCIENT TIMES. (FROM THE 2ND (UNPUBLISHED) VOLUME OF "FOUILLES D' EPIDAUROS" BY THE LATE PROFESSOR P CAWADIAS.)

Anaxagoras introduces the knowledge of humors by describing the bile, of which he distinguishes two varieties, the black and the yellow. He himself attributes disease to a disturbance of the bile. This is the origin of the humoral theory of disease.

Diogenes of Apollonia introduces the notion of pneuma. Pneuma is in general air, but an air that has a special constitution, that is even endowed with intelligence, and penetrates all bodies. This conception will give rise later to the Pneumatic doctrine of disease.

Democritos of Abdera, one of the greatest philosophers of the ages, and also a great physician whose numerous medical works unfortunately have disappeared, develops the teachings of Leucippus and introduces the Atomic theory, of which Carnot said rightly that "none of the ideas that antiquity has bequeathed to us has had a greater or even similar success."

The body is constituted of small solid particles, the atoms separated by pores. Health is the right relation between atoms and pores. Disease is the disturbance of this equilibrium, therefore a disturbance, not of the humors, but of the solid parts. The pathological applications of this atomic theory exist in germ in Democritus, but they will be developed much later, by Erasistratus and by Asclepiades.

Thus with these three great philosopher physicians, the general conception of disease takes a more definite form, and from their time date the three separate conceptions of disease which have divided medicine until our days, when they have been combined in the Neo-Hippocratic theory. These doctrines are the short-lived pneumatism, solidism and humorism.

On the basis of the work of these physiologists this period of Greek medicine will be characterized by a more precise conception of the mechanism of disease, but at the same time it will develop to a high degree clinical methods.

The Late Italo-sicilian Schools. Although eclipsed by the splendor of their contemporary schools of Cnidos and of Cos, the late Italo-Sicilian schools continued to flourish, and amongst these late Italo-Sicilian physicians (of the fifth and the fourth centuries) two names must be remembered regarding the history of the conception of disease.

Philolaos of Croton was perhaps the first to formulate the humoral theory basing his work on that of Anaxagoras. Disease for Philolaos was determined by certain environmental factors such as too little heat, or bad food, which brought about a disturbance of bile, blood and phlegm.

Philistion of Lokri, was the first to formulate the pneumatic conception of disease. He considered that health consisted in the right respiration and exchanges of air through the pores, and that in disease, the disturbance of that respiration played a preponderant rôle.

The School of Cnidos. From a physiological point of view the Cnidian physicians follow the conceptions of the early schools of Croton and Sicily, and the teachings of the philosopher physicians of the fifth century. The most famous of the Cnidian physicians, Euryphon, adds a more precise conception as to the mechanism of disease, by demonstrating that disease is determined by the accumulation of undigested food. He gives therefore the first conception of alimentary toxemia.

The great work of the Cnidian physicians was made on clinical lines, and it is regarding the great advance as to precision in diagnosis that they are famous.

The physicians who flourished before the Cnidians considered the only reality in medicine, the diseased individual. But the morbid phenomena are extremely numerous and of great variety. A method had to be found so as to put a certain order in this multiplicity of phenomena, so as to classify medical knowledge, and to give a safe basis for diagnosis. This method was found by the Cnidians, and consists in the introduction of the fictional conceptions "of disease." The physicians of Cnidos observed that many morbid phenomena, that is symptoms, shown by various individuals occurred with a certain regularity and in a certain combination, they abstracted these combinations of symptoms from the diseased individual and constructed fictional species, which they called "diseases." Since that period medical work has been ordained following this division into morbid categories, or "diseases," and also diagnosis and treatment has been based on these determinations of such "diseases."

The physicians of Cnidos knew that the pure nosographical diagnosis was not sufficient, and that disease was, as we say today, a fiction. They knew how to pass from the "disease" to the diseased individual, and the opposition which is often given in various academical discourses between Cos and Cnidos did not really exist. It is often said that the physicians of Cnidos had as their sole object the diagnosis of the "disease" and based their treatment on that diagnosis, and that, on the contrary, the physicians of Cos had as their sole object the diagnosis of the diseased individual and based on that "diagnosis of the person" their treatment. This idea is based on the erroneous interpretation of certain texts. It must not be forgotten that personal rivalries played a great rôle in the life of the ancient Greek physicians. The Cnidian physicians introduced disease as a means of classification of medical knowledge, and as a stepping-stone, but they were not ontologists. Like the Coans, like all other Greek physicians, they knew how to pass from the "disease" to the diseased individual.

THE SCHOOL OF COS. The School of Cos is dominated by the figure of Hippocrates the greatest of physicians of all ages.

Hippocrates made a great advance in the conception of disease. He bases his work on the doctrine of equilibrium, of the Magna Graecia physicians, and on the theory of humors of Anaxagoras. He considers that disease is explained by the disturbance of the equilibrium of these humors, but makes two additions of great importance. The first is, as we say today, the principle of constellation of etiological factors. This disease, this disturbance of humors is determined by the action of changes of the environment, whether these changes are meteorological or alimentary, or due to defective hygiene in general. The second addition to the conception of disease, and by far the most important, is the doctrine of the Physis. The body itself tries to restore this disturbed equilibrium φὒσει, νοὒσων ἶατρσὶ. This conception of the general mechanism of disease dominates even contemporary medicine, and it is on the Hippocratic ideas that the modern theory of disease is based, and that is why it is known as the Neo-Hippocratic Theory.

Diagnosis and treatment advanced with Hippocrates much more than the conception of disease. In fact his method forms also the basis of the diagnostical and therapeutical methods followed by all great physicians of all centuries. Hippocrates bases his diagnosis, in part at least, on nosographical considerations of the "Person." But from the diagnosis of the "disease" which is for him only a stepping-stone he passes to the diagnosis of the patient. This part of diagnosis constitutes his greatness, and it is in the school of Cos that the real origin of personal diagnosis is found, as in Cnidos the origin of nosographical diagnosis. Cos and Cnidos are the two pillars of medical diagnosis, and therefore of treatment.

His personal diagnosis Hippocrates himself bases on the most accurate clinical observation. He examines carefully the symptoms shown by the patient; he examines also the etiological conditions which have presided on the occurrence of disease, and basing his work on examination he tries to find out what really happens in the body of the patient. For that part of his diagnosis he has of course to take also into consideration his physiological knowledge, but with him physiology is the guiding star only. He does not base himself wholly on physiology, and if he comes to any physiopathological conception, he controls it strictly through clinical observation.

Thus the Hippocratic Method is distinguished from the Empiric, because Hippocrates tries to find out what happens in the body of the patient, which the Empirics refused to do. It is also distinguished from the physiological (or dogmatic method) because with Hippocrates physiology is not the basis of diagnosis or of treatment, but serves only as a guide for clinical work.

The pupils of Hippocrates expanded the doctrine of the master. Two of them Diocles of Carystos and Praxagoras of Cos and also the sons of Hippocrates, Thessalus and Dracon, laid stress on physiopathological conceptions more than was done by the Master; in fact they tried to find out a physiological, a rational basis for disease and thus they form a transition with the third period of Greek medicine in which the physiological method became preponderant.

THIRD PERIOD OF GREEK MEDICINE. (THIRD CENTURY B.C. TO SECOND CENTURY A.D.)

This period extends from the foundation of the School of Alexandria in the early third century B.C. to the birth of Galen (130 A.D.). It is characterized by the progressive importance of physiological knowledge and by the preponderance of the physiological method in the approach of disease, contrasting with the Hippocratic or clinical method. The physiological method degenerates into dogmatic considerations and as a reaction the school of the Empirics is founded which repels all the physiological considerations. Some physicians return to the Hippocratic method.

Aristotle is the physiologist who can be considered as the originator of that new period of medicine. With this great master biology, and especially physiology, are no more limited to vague elements or to vague Pneuma, Humors, Atoms. A careful study of embryology, anatomy, and of the working of the mechanism of the body is made. This physiological work which will be continued by the two great Alexandrian physicians Herophilos and Erasistratus, gives the great impulse towards the introduction of more precise physiological considerations which characterizes this phase of Greek medicine.

THE SCHOOL OF ALEXANDRIA. With the Alexandrians the physiopathological conceptions make a great advance. Herophilos remains faithful to the humoral doctrine, Erasistratos believes that the elements whose disturbances bring disease are not the humors, the liquid elements of the body, but the solids, because his anatomical dissections had taught him to think in terms of organs. From a vague theory the conception of disease passes into a more precise knowledge due to the accurate dissections of experimentation.

To the method of diagnosis of the Alexandrians, which was influenced by important additions of physiopathological researches, was added up to a certain point the general lines of the Hippocratic method. They themselves based their work on nosography and the more so that Cnidos played a great rôle in the establishment of the school of Alexandria. From the disease they knew how to pass to the diseased individual, keeping always to a strict clinical observation, but for their general classification, and for the treatment of the disturbances of the diseased individuals, they themselves based their work also in great part on their physiopathological conceptions. In fact the great Alexandrians, regarding the method of diagnosis, can be described as Hippocratists, but with a greater tendency towards physiopathological deduction.

THE DOGMATIC SCHOOLS. This tendency to base diagnosis and treatment on physiopathological conceptions reaches a high degree in the so-called Dogmatic Schools. These schools differed from those of Herophilos and Erasistratus on the one hand, because clinical observation plays in their practice a much less important rôle, and deductions from physiology a much greater, and on the other hand because their physiology is compressed into simple formulas, into rigid dogmas. The most celebrated dogmatic physicians are classified into two groups, that of the Methodists and that of the Pneumatists. The school of the Methodists was founded by Asclepiades of Bithynia in the first century B.C. Asclepiades himself was not very rigidly dogmatic; he developed the general conception of disease by reintroducing into medicine the atomic theory of Democritus. For him disease did not consist in disturbances of the equilibrium of the humors, but in a disturbance in the relation between atoms and pores, that is, in a disturbance in the equilibrium of the solid parts of the body. Contrary to the doctrine of Hippocrates he denies the existence of curative forces, that is of the *physis*, in the living being; thus the work of Asclepiades marks a difference in the general conceptions of disease by the consideration of the solid parts of the body. But it marks also a retreat on account of the neglect of the physis.

Regarding his method of diagnosis and treatment Asclepiades can be compared to the great Alexandrians, because he used clinical observations to understand and to treat the patient; but as the great Alexandrians, and perhaps more than they did, he based his work on physiopathological conceptions.

The pupils of Asclepiades and principally Themison of Laodicea a physician of the first century B.C. and Thessalus of Tralles, a physician of the first century A.D., neglected completely the clinical method of diagnosis and treatment, which were based purely on physiopathological conceptions derived from those of Asclepiades, but compressed into a rigid dogmatic formula. For them, all diseases depended upon abnormal conditions of the pores, abnormal conditions which were only of two sorts, those resulting in a condition of tension, and those resulting in a condition of relaxation. There were therefore two communities of disease, and only two methods of treatment.

The rival dogmatic school, that of the Pneumatists, was also constituted by physicians who based their diagnosis and treatment on physiopathological theoretical conceptions derived from the doctrine of the Pneuma.

THE EMPIRICS. One sees where the exclusive use of the physiopathological method was leading medicine. Diagnosis and treatment cannot be based on physiological knowledge alone. Hippocrates had already demonstrated that physiology is only a sort of guide to clinical observation, which remains the only method in medicine.

Even a more or less scientific physiology cannot be taken as sole basis for diagnosis and treatment, and that had been demonstrated by the great Alexandrians themselves. When instead of a broad and scientific physiology a compressed physiological dogma is taken as the basis of diagnosis and treatment, the result is often worse. The development of this one-sided physiological approach to disease, and the practical non-success in which it resulted, brought as a reaction, the origin of another very famous school, that of the Empirics.

This school started as an immediate offshoot of the school of Alexandria in the third century B.C. and its origins were greatly helped by the teachings of Pyrrho, the chief of the sceptical philosophers.

The first great Empirics of the third century were Philinios of Cos and Serapion of Alexandria. Other great Empirics flourished later, such as Glaucias of Taras in the second century B.C. and Heraclides of Taras, the Prince of the Empirics in the first century B.C., Menodotus, of Nicomedea in the second century A.D. It is to the Empirics that the pharmacologists are attached, that is, the physicians who studied on man the effects of drugs and of poisons, the most celebrated of them being Dioscorides, who lived in the first century A.D.

The Empirics did not develop the conception of disease or the knowledge of its mechanism; in fact they considered that it was unnecessary and impossible to try to find out what really happens in the body of the patient. Their method of diagnosis and treatment was based purely on clinical observation. They studied their patients, they grouped the symptoms into symptom complexes, which they called syndromes, and they tried to find out what therapeutical methods were good in one or another combination of symptoms.

They developed to a very great extent the method of clinical observation, and based it on what is known as the Tripod of Glaucias, that is on the independent observation made by accident or by experiment (τὴρησι), on the record of observation of others (ἱστορία) and on the conclusion by analogy (Ἡ ἀῶὸ τοῦ ὁμυὶον ἆμολονδὶα), this conclusion by analogy directed for the treatment only. In fact for the Empirics diagnosis was treatment, the similarity of the syndromes furnished them with a clue to the necessary remedy, and the similarity of action of certain remedies pointed to a correspondence in morbid manifestations. Their favorite motto was "the important question is not what causes disease, but what dispels it."

LATE HIPPOCRATISTS. Tired of the one-sided view of the Dogmatists and the Empirics, many Greek physicians returned to the Hippocratic Method. They used once more the accurate bedside observation of symptoms and of the etiological conditions, which had determined the occurrence of disease, and tried thus to gain knowledge of what was occurring in the body of the patient, of the physiopathological disturbances which were taking place in the body of the patient. They used also as a guide in their interpretation of symptoms their physiological knowledge, richer than in the days of Hippocrates, but taking great care not to let physiological conceptions dominate their diagnosis and treatment. Three great physicians of the first century A. D., Rufus of Ephesus, Soranus of Ephesus and principally Aretaios of Cappodocia can be described among these late Hippocratists.

FOURTH PERIOD OF GREEK MEDICINE
GALENIC. (130–200 A.D.)

GALENOS.[1] In the history of medical thought Galen must be considered as representing an epoch of medical thought by himself. Like the Ionian physiologists of the seventh century

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[1] The word Galenos and (not Galen) is used because it corresponds to the Greek αληνός.

B.C., like the physiologists of the fifth century B.C., Anaxagoras, Democritus, Diogenes of Apollonia, like the great physiological pioneer of the fourth century, Aristotle, Galenos did an important physiological and philosophical work, which should have marked the beginning of a new phase of Greek medicine. Unfortunately this work was done in a period in which the creative genius of the Greeks was at a low ebb, and the only physician who could base his researches on this important physiological work was Galenos himself. The physiology of Galenos marks a great advance. The first physiologists of the seventh century had given a vague notion of elements. The physiologists of the fifth century had given a greater precision by introducing the notions of pneuma, humors, atoms. Aristotle had directed physiology towards a more precise knowledge of the functions of life, of the functions of the various organs and systems. Galenos advances that work of Aristotle by introducing, and this is his immortal title to fame, the experimental method, and thus reaches, regarding the functions of circulation, of digestion, of the nervous system, of all the other systems and organs a great precision in knowledge. This is the place in history of Galenos the physiologist.

Galenos the physician, uses that physiological work as a basis as the physicians of Croton and of Sicily had based their work on that of the first Ionian physiologists, as the late Italo-Sicilian schools and the schools of Cnidos and of Cos of the fifth and sixth centuries had based theirs on the work of Anaxagoras, Democritus, Diogenes of Apollonia. As the schools of Alexandria and all the other Greek physicians of the last three centuries B.C. and of the first two centuries of our era, had followed the route traced by Aristotle.

Basing himself on this physiological work Galenos accentuates, from a diagnostical and therapeutical point of view, the physiological method of diagnosis. Many physicians who came after Aristotle, as we have seen, tried to diagnose their patients, basing their deductions on their physiological knowledge, but controlling it to a great extent through clinical observation. They thus simply modified the Hippocratic method by introducing a great deal of physiological deduction. Galenos places the whole of his diagnosis and treatment on physiological deductions. Galenos the physician is carried away by the discoveries of Galenos the physiologist. His method, from a purely medical point of view, used exclusively, is wrong, because diagnosis and treatment cannot be based on physiological knowledge, that is on a knowledge which changes every day; but although his method was wrong, the rôle he attributed to physiological knowledge in diagnosis has come into medicine to stay, and in contemporary medicine, although, of course, the preponderant rôle in diagnosis and treatment is held by clinical observation as in the Hippocratic method, the process which makes us interpret all symptoms and signs so as to discover what really occurs in the body of the patient is based on physiological knowledge and much greater than in the original Hippocratic method.

With Galenos the creative period of Greek medicine ends and another period begins with the compilation and transmission period. This, too, merits study because it is of great significance for medicine in general, because it is through the work of these last Greek physicians, those who worked between the death of Galenos and the fall of Constantinople, that Greek medicine was transmitted to the West, and to the World all over.

Of the legacy bequeathed by ancient Greece to the world, medicine is without doubt the noblest, the greatest part.

DR. J. C. NOTT AND THE TRANSMISSION OF YELLOW FEVER*

By ROBERT WILSON, M.D.

CHARLESTON, S. C.

J. C. NOTT of Mobile, Alabama, is generally credited with having advanced the hypothesis that yellow fever is transmitted by mosquitoes or other insects, as early as 1848. Thomas Craig, for example, says that "Nott considered the subject [i.e., transmission by insects] as already proven," and according to Garrison "Nott was also one of the first to suggest the 'mosquito theory' in reference to the transmission of yellow fever (1848)." The writer of the sketch in Kelly's "American Medical Biography" after quoting freely from one of Nott's papers remarks: "thus he paved the way for the work of Walter Read"; leading the reader to infer that Nott's conception had a direct bearing upon the hypothesis worked out so brilliantly by Read many years later. The case for Nott was presented even more strongly by Dr. Wm. M. Polk in an address delivered at the semi-centennial exercises of the New York Obstetrical Society. He says: "In 1848 Dr. Nott made observations upon the mosquito as the conveyor of yellow fever, and published his conclusions in the *Southern Surgical Journal* of that year. He believed the mosquito was the agent of propagation and so states in this article."

A careful review of Nott's writings, however, seems to make it clear that the modern conception of the transmission of yellow fever and of malarial fever had not occurred to him at all. Indeed, he expressed the opinion very definitely that these diseases were not transmitted from the infected to the uninfected, but in each instance resulted from the invasion of the body from without, through unknown means, by some animal organism. The whole purpose of his argument was to point out that the analogy between certain known phenomena of insect life and the epidemiology of yellow fever gave support to the hypothesis of animalcular origin, it was not to suggest the mode of transmission. He uses the expressions "insect theory" and "animalcular hypothesis" interchangeably, and it seems evident that insects, infusoria and animalcules are terms which also are used interchangeably to embrace the lower forms of animal life. He argues that the causative factor of yellow fever must be one of these lower forms for the disease behaves as it would behave if this were the case. In this conception of its etiology he was a precursor of Laveran not of Walter Read.

His first article entitled "Sketch of the Epidemic of Yellow Fever of 1847 in Mobile" was published in the *Charleston Medical Journal and Review* in January 1848. In this article, referring to "a paper soon to be published" in which he proposes to advocate "the *non*-identity of periodic and yellow fever," he says:

> You will see by the article alluded to that I have come out at length in favor of the *Animalcular Hypothesis* as the most

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* Read before the Medical History Club of Charleston, S. C.

> rational for accounting for the origin of this disease, and I will not travel over the same ground here, but will merely mention the fact, that our late epidemic presented one of those strange freaks so often seen, and which lends support to that idea. In the early part of its course it was confined very much to a belt of the town, three or four squares in width, running from north to south the entire length of the town, parallel with and about one third of a mile distant from the docks. There were scattering cases out of this belt, and after a few weeks the disease spread over the whole town. The disease in Mobile, as well as in New Orleans, commenced early—*ran its course, and ceased in the midst of warm weather, long before frost;* thus showing a strong analogy with the habits of insect life. There was no weather *to stop animal and vegetable* decomposition. Many insects, like epidemics, have a limited time allotted them; but vegetable and animal decomposition only cease with hot weather—but on this point I must refer to reasons given elsewhere.

He is arguing here in favor of the "animalcular" origin as against the more widely accepted view that the disease originated from the decomposition of vegetable and animal matter and is not discussing the mode of transmission. It is true that as we read his argument now it seems to lead straight to the hypothesis of insect transmission, so clearly, indeed, that one wonders how this thought could have escaped him. For example the following paragraph from his paper published in *The New Orleans Medical and Surgical Journal* several months later seems to indicate a conception of insect transmission:

> It would certainly be quite as philosophical (as the Malarial Theory) to suppose that some insect or animalcule, hatched on the lowlands, like the mosquito, after passing through its metamorphoses, takes flight, and either from preference for a different atmosphere, or impelled by one of those extraordinary instincts which many are known to possess, wings its way to the hill top to fulfill its appointed destiny . . .
>
> Many of the infusoria, as well as insects proper are rendered inactive by too much light, heat, or dryness. They remain quiet during the day, and do their work at night. This fact is too familiar to require illustration. The moth tribe, the night mosquitoes, many of the Aphides, etc., are familiar examples.

But the further development of his theory shows that these facts are not quoted to illustrate the probable mode of spread, but to give plausibility to the belief that yellow fever is caused by some animal organism which may be transported from place to place in various ways, but not by infected persons, and which may lie dormant perhaps for a long period of time and then through some unknown influence become active again and invade the human body. Analogies from insect life are cited in support of this view.

While not discussing the origin of malaria, he is unable to escape the conclusion that this fever too has a similar origin.

> It was not my plan to argue the Insect origin of Periodic fevers in this paper, but the morbific causes of fevers have been so long and so inseparably united in the minds of the profession that it is almost impossible to tear these asunder now . . .
>
> The Insect theory is perhaps as applicable to periodic as Yellow Fever.

He regarded yellow fever as non-contagious and consequently did not believe that the germ could pass from one person to another by any means. In referring to contagion, he says:

> If by this term we understand that a morbid poison generated in one living body may by contact either mediate or immediate reproduce an identical disease in another, then we are justified in denying that Yellow Fever is a contagious disease. But while without hesitation I take this position, I am equally strong in the conviction that there exists no conclusive evidence, that the germ or *materies morbi* may not be transported from one locality to another. There are many curious facts connected with this question which require a passing notice . . .
>
> There is not time here for discussing this point, and I will only say that the mass of authority in favor of this opinion is such as to challenge our full respect; no reasonable man, in the present state of facts, can assert positively that Yellow Fever may not under peculiar circumstances be transported.

This transportation, however, is not through the medium of an infected person, but by merchandise. He asks:

> Why may not the morbific cause be carried and thrown out of a vessel with a cargo of damaged coffee, potatoes, grain, sugar, meat etc.? The germ might here find a hiding place . . .
>
> We have evidence around us almost constantly that the germs of insects lie dormant for indefinite periods and are then suddenly called into activity and propagated with inconceivable rapidity. By what physical causes these sleeping and waking states are governed, human sagacity cannot yet discover.

And he quotes the following from Sir Henry Holland:

> It is probable that Yellow Fever is caused by an insect or animalcule bred on the ground, and in what manner it makes its impression on the system, is but surmise—unless the animalcule is, like that of Psora, bred in the system, we could no more expect it to be contagious than the bite of a serpent. We may, therefore, easily understand, that it can at the same time be transportable in the form of a germ, and yet not contagious.

After pointing out some further analogies he continues:

> Having no favorite hypothesis to sustain, and no other end in view but the truth, it is proper to state that I have never myself witnessed any facts which would add strength to the opinion that Yellow Fever is transmissible.

He admits, however, that there is "a mass of facts collected by numerous authorities on this point, which must be received at least with respect" and "although we cannot point to the chain of cause and effect, the circumstances in connection with the strange habits of diseases known to be transmissible, are sufficient to excite suspicion."

Notwithstanding this suspicion he himself continues to be doubtful:

> Let any one desirous of honestly investigating this subject read the thirty years' war between the New York and Philadelphia schools, and he will find much material for sober reflection and doubt on the transmissibility of Yellow Fever.

This is not the language of one who is convinced that yellow fever is transmitted from infected persons by insects. Nor is his attitude toward quarantine measures consistent with such an opinion:

> *A vessel with Yellow Fever on board* should not be allowed to lie near a town, but here the restriction should cease. If Yellow Fever is transportable by vessels at all, the instances are so rare, as not to justify very rigid quarantine regulations

Twenty-two years later, in 1870, Nott, then living in New York, presented to the Board of Health of that city a report upon the outbreak of yellow fever on Governor's Island. In this report he discusses the cause of the disease and reverts to his former views, and again argues in favor of an animalcular or insect origin. In this report he goes so far as to refer to the conveyance of malignant pustule by bites of gnats as illustrating one of the ways in which disease might be carried by insects or fungi:

> It is possible that even insects may exist a million times smaller than any the microscope has yet reached. While the slow and steady progression of yellow fever from a point, as I have described it, should be received as an indisputable fact, on the other hand we confess that the fact is at present inexplicable; it must be some form of living organism, which multiplies and extends by organic laws. If in insect form, it is easy to understand its progress, and, if a fungus, we are not without examples in the larger fungi, of a manner of progression from a given spot more rapid than that of yellow fever. Moreover, it is the business of some insects to distribute certain seeds of plants far and wide; to carry the pollen of one plant to another to fructify it; and it may be the duty of others to disseminate diseases. It is well known, on the authority of Murchison and others, that the malignant pustule is taken by gnats from the animal and communicated to man by its bite. So there are many ways that diseases might be carried and communicated by insects or fungi.

This paragraph does not give the impression of any clearer conception of the transmission of yellow fever than is afforded by his earlier writings, but merely shows that his belief that an animal organism is the causative agent is still as strong as ever. The suggestion that it may be the duty of some insects to disseminate diseases and the reference to the bites of gnats communicating malignant pustule to man seem to bring him startingly close to the truth, but yet he says elsewhere in the same paper that yellow fever

> . . . *is not* generated in the human system, or transmitted from one person to another in any way, [but that the] germ or poison is generated *outside* of the human system, and is taken in after the manner of marsh malaria poison. But, unlike the latter, its *germ is portable*, and may be carried in vessels, trunks, baggage cars or railroads, etc., from one point to another, and thus propagated.

In the following paragraph he uses the example of mosquitoes only to explain by analogy the apparently greater susceptibility of newcomers to the infection of yellow fever which he believes to be likewise a poison of animal origin:

> I will here mention a fact which I have often noticed myself with regard to *mosquitoes*, but have never seen it alluded to by others. These insects are so abundant in Mobile, New Orleans, and other Southern cities, that it is impossible to sleep at night without the protection of mosquito nets. Fair-skinned persons from more northern climates, and particularly young children recently introduced, suffer greatly from the bites of this insect, the bites often inflaming, and even making tedious troublesome sores; whereas the children of parents who have lived a generation or two in the climate suffer comparatively little; they seem to become acclimated against the poison of yellow fever. On rising from my bed in the morning I have many times seen my little children lying in a trundle-bed covered by mosquitoes, after, as Mrs. Jackson

said, 'kicking the kiver off.' The insects had been biting at them for hours, and yet by breakfast-time every mark had disappeared. Such would not be the case with children of fair-skinned parents recently brought into the clime. Some Southern children, it is true, are more susceptible to the poison of mosquitoes than others, and so it is with regard to susceptibility to yellow fever.

The observation which had been made frequently by Ferguson and others that those living in the upper stories of houses are less liable to infection than those who live on the ground floor suggests to him the possible habitat of the germ:

> *Insect Hypothesis.*—The only hypothesis which, in our present state of knowledge, has any plausible support, and which may assist in directing our future researches, is that which supposes the agency of some minute insect or other organic form, animal or vegetable, possessing the powers of *self-propagation and locomotion*, and which, from its deliberate mode of progression, in spite of calms or winds from all points of the compass, would *seem to travel upon the ground*, where it will be found by the microscopist, if ever detected. We have abundant authority to show that yellow fever is most active in its operation near the surface of the earth. It attacks persons in a larger proportion on a ground floor than on the stories above, and the immunity increases as we ascend in a house.

Then follow these analogies:

> It is killed, like insects and plants, by a temperature of 32° Fahrenheit. It is more active at night than in the day, as is the case with insects of various kinds. Like insects, it is erratic as to points of attack, appearing at points here and there in the most unaccountable way.

He reiterates his opinion that the germ may lie dormant for long periods and in some way become active again:

> It occurs too, unlike marsh fevers, at irregular periods of several or many years, as many insects do, the germ lying dormant and waiting for its exciting cause.

In support of this opinion the insect world affords numerous analogies:

> It is well known that the eggs of many insects, like the seeds of plants, may retain their vitality for years, and some of the infusoria, as the Rotifers, etc., may be exposed for months to a tropical sun, and become as dry as the sands of Africa, and yet be resuscitated by the application of moisture.

He believes that the germ may linger after an epidemic producing outbreaks occasionally before dying out completely:

> But let one of those big overflows of yellow fever come surging up from the Gulf, and overflowing Philadelphia, New York, Boston, and all the smaller intervening towns, as happened in former years, and you will see a *germ left behind*, here and there, that will spring into life from time to time, until, as certain other exotics, it dies out. The Newfoundland dog and the orange tree may live for a succession of years in our Southern States, but soon or late die out and must be replaced. So with yellow fever on our Atlantic coast.

Another observation which he could not explain was that yellow fever did not spread in every port into which it was introduced. To account for this fact he suggested that there might be two varieties of yellow fever, a portable and a nonportable variety:

> That yellow fever should be at one time *portable* and at another *not* portable, if true, is a fact in the present state of our knowledge inexplicable, but there are contradictory facts attending other diseases which are acknowledged to be

contagious and portable, that are equally inexplicable.

He still declares his disbelief in the contagiousness of yellow fever, but is emphatic in his belief in its portability by various media, but insects are not mentioned among these:

> If the germ originates and is propagated *independently* of the human body, we can readily understand how it might be carried in a ship or trunk from place to place, and turned loose to propagate, but the existence of such a germ is a mere inference, based on the natural history of the disease.

He is puzzled, however, and admits the difficulty presented in attempting to square observed facts with his hypothesis:

> The laws by which yellow fever is disseminated present difficulties which I am not disposed to smooth over, as the truth alone can be of use to us.

To explain how yellow fever may find its way from an infected vessel stopped at quarantine in the Narrows at a considerable distance from the shore he assumes the existence of a possible "epidemic force:"

> It is communicated under such circumstances, according to my opinion, by its own epidemic force, or by the conveyance of the germ in trunks, etc., through illicit intercourse; one, or both these causes combined, is sufficient to account for its extension.

His final conclusions are:

> It springs from a living germ that has the power of selfpropagation.
>
> The germ is not reproduced in the human system, and the disease, therefore, is not contagious.
>
> The germ is portable by vessels, baggage cars or railroads, in boxes, and possibly in exceptional cases about the persons of individuals.
>
> Quarantine, or sanitary measures, have no power to arrest an epidemic wave.

Undoubtedly Nott was a good observer, and a man of wide learning, but his logic failed to give him the solution of his problem because he lacked the essential knowledge of the rôle of the intermediate host; and his learning afforded him no analogy. Notwithstanding this he stands out among the men of his time as a clear and forceful thinker, and deserves a large measure of credit for pointing out so insistently the essential nature of the causative agent of yellow fever.

THEODORE KOCHER

By E. ROBERT WIESE, M.D., AND JUDSON E. GILBERT, M.D.

SCHENECTADY, N. Y.

TO write the biography of a master surgeon, but recently deceased, is an undertaking fraught alike with pleasure and perplexity. While distance often lends enchantment, certainly it always affords perspective and obviates, to some extent, the pitfalls of undue adulation. The less modern subject seen in relation to his time and contemporaries, permits the important features to be the more readily recognized because of their prominence, while other less pleasant characteristics fall into the shadows of oblivion and are covered by the kindly dust of time.

Theodore Kocher, master surgeon, brilliant researcher, superb teacher and gentleman, was born in Bern, Switzerland, August 25, 1841. In these times when it would seem that all successful men must, of necessity, spring from humble origin, it is a relief to learn that his ancestry was by no means obscure. The Kochers originated in Buren, a small Swiss village, where they were long known as expert cabinet makers and joiners. His father, Alexander Kocher, however, was an engineer of no mean attainments, who traveled extensively in pursuit of his profession. Marie Wermuth Kocher, his mother came from Bürgdorf, a beautiful small town, where the youngster Theodore, with a brother one year his senior, spent part of his early days. This older brother later became postmaster and, by a peculiar coincidence, died one year before him. Their proximity of age naturally tended to foster in these two boys similar likes and a strong bond of affection. And it is, therefore not, surprising to find that when the older boy went to school at the age of five, Theodore insisted upon accompanying him. No effective objections were evidently raised and Theodore entered his school life when only four years old. He attended the schools of Bürgdorf and Bern for the usual number of years and, contrary to the now generally accepted views regarding great men, nearly always led his classes. But let those parents, who would that their children go and do likewise, remember that Alexander Kocher and his wife took a keen interest in their boys' schooling and cooperated to the fullest extent with the teachers. Under such circumstances it is not surprising to find Theodore Kocher's name among those matriculated at the University of Bern in 1858. For a time, it would seem that the seventeen-year old youth was undecided what profession to follow as a life work. Why he determined upon the study of medicine is a question; there were no doctors in the family and it is not known whether any physicians spoke to him regarding his career; several of his teachers had urged him to become a philologist; and two paintings in his reception room of later years bore witness to the fact that he possessed pronounced artistic ability; but the decision was made and once made was adhered to with a tenacity and a singleness of purpose that are scarcely credible. It is interesting to learn the names of some of those who taught him. Among these were Professor Aebi, head of the department of anatomy; Professor Valentine, the physiologist; Professor Demme, the surgeon and the famous internist Biermer. Kocher, however, was especially attracted by anatomy and here laid the foundations of that exact and complete knowledge that later contributed so generously toward making him world-renowned. After graduating at the age of twenty-four (1865) he took both doctor's and state examinations and then spent one year (1865–1866) in visiting and studying at foreign clinics, with Langenbeck in Berlin; Billroth in Vienna; Lister in Edinburgh; Pasteur and Verneuil in Paris. Upon his return to Bern in 1866, he became assistant to Lücke at the University Clinic and later that same year became Privat-Dozent. It is noteworthy that the subject of his dissertation, "Die Behandlung der Croupösen Pneumonie mit Veratrum Präparaten," is a purely medical subject, one of the few he ever wrote. In 1872 Lücke was called to the chair of surgery at the University of Strassburg and Kocher was given the chair vacated in Bern.

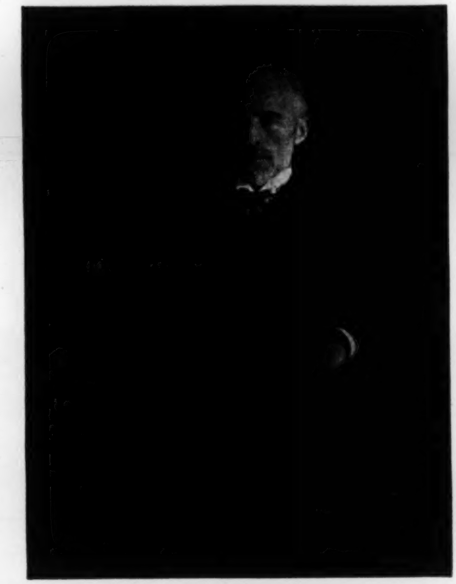

FIG. 1. THEODORE KOCHER.

There now began forty-five years of continuous, intense and persistent work, concentrated upon one subject, surgery, that was destined not only to make Kocher famous but was literally to establish a new school of surgery. A list of operations either directly devised or perfected by him resembles nothing so much as the index of a modern textbook of surgery. Although a general surgeon there was scarcely a subject in special surgery he did not write about and enrich by his writings or his research. While time and space alike forbid a detailed account of all his accomplishments, it is permitted to touch lightly upon the work that has made him famous.

From his pioneer and epoch-making researches and surgery on the thyroid gland we have detracted little and we have added less. Because of his exact knowledge of anatomy and physiology he was enabled to devise an operation that has become a model in thyroid surgery. His knowledge and finished technic reduced thyroid mortality in the Swiss Clinic from eighteen to less than ½ of 1 per cent, a figure that not a few surgeons even today will strive to emulate. Bern became a Mecca for those afflicted with thyroid disturbances and during the course of his activity Kocher operated upon more than 9000 thyroids patients, 1200 of whom were of the hyperthyroid type. To him we owe our knowledge of cachexia strumipriva, as well as observations which inaugurated our knowledge of the physiology and surgery of the entire endocrine system. While not generally known, Kocher was the first to emphasize the importance of blood-picture changes and coagulation time as a means of early diagnosis and prognosis both in hypothyroidism and hyperthyroidism.

Profiting by the experiences of McDowell, Lawson Tait and others he entered the field of gynecology and was among the first to successfully perform ovariotomy, hysterectomy and hysteropexy in the aseptic manner employed today.

In brain and spinal cord surgery he was preeminent. Nowhere, perhaps, is the value of experimental surgery more clearly shown than in Kocher's work in this field. His conclusions regarding traumatic epilepsy and intracranial pressure were valuable, while even today his method of localization of spinal cord injuries has stood the test of time and is followed by surgeons and neurologists, perhaps ignorant of its originator.

Next to Billroth, Kocher by introducing methods, probably did more than any other man to make gastrointestinal surgery a science. Not the least of his contributions to this branch was the introduction of a special intestinal stitch. Besides inventing the method of mobilization of the duodenum after resection of the pylorus for carcinoma he gave us the operation for cancer of the rectum as much used as the generally known Kraske method (1897).

His operation for inguinal hernia, used so successfully by many surgeons, is a model of efficiency and simplicity based upon anatomical principles.

Probably the first thought that flashes into the mind of the average physician when Kocher's name is mentioned is his method of reduction of subluxation of the shoulder joint. This was first demonstrated in the famous Billroth Clinic when Kocher visited Vienna in 1870. Rarely, if ever, has the exact knowledge of anatomy and mechanical principles been better or more logically applied. This among his first papers is a startling proof of the complete mastery of the subject possessed by the young Privat-Dozent. A similar but, oddly enough, lesser known paper depicting the analogy of the hip and shoulder dislocations and their treatment appeared four years later (1874).

Because of his profound knowledge of anatomy his concept of fractures was fundamental. In pre-roentgen days his ability to diagnose and treat these conditions was well-nigh uncanny; and it is said that even after the *x*-ray was in general use in other clinics, Kocher resorted to its evidence only to convince the "doubting Thomases" among his hearers of the correctness of his statements. This knowledge of fractures stood him in good stead in his work in war surgery, a subject always of the greatest interest to him. As early as 1866 we find him Sanitäts Leutenant in the Swiss Army; during the Franco-Prussian War (1870) he delivered a series of lectures on war surgery to a select group of students and became First Lieutenant. Three years later he was made Captain, to be again promoted in 1875 to the rank of Major and later Colonel. In 1877 he became a member and then President of the Military Pension Commission, an office he held until the time of his death. Gunshot wounds and their effects early attracted his attention and in 1875 he showed by experiment that the explosive action of close range, small caliber, gunshot wounds was due to hydrodynamic force. In the treatment of these wounds he was among the first to apply Lister's method, as a result of which their frightful mortality became a thing of the past. It was but natural in connection with gunshot wounds that hemorrhage should engage his attention. During his efforts to produce hemostasis by acupressure, ligature or torsion he was able to show that internal coagulation was the important factor. His interest in this subject never waned; every new method was tried and so we need not wonder when we find Fornio working under Kocher's guidance in 1912.

Genitourinary surgery was too important a field to have been neglected by him. In 1874 he was asked to write the section devoted to the surgery of "The Testicle and its Tunica, the Epididymis, the Cord and the Seminal Vesicles" in Pitha and Billroth's "Text-Book of General and Special Surgery." This was a masterful exposition of the subject. Thirteen years later a much elaborated revision of this monograph appeared in "Deutsche Chirurgie" under the caption of "Diseases of the Male Genital Organs." Interest in this branch never abated as is evidenced by a paper on the surgical treatment of nephroptosis in 1913.

It has been commented upon by several writers that Kocher's work was nearly always macroscopic and that nowhere has he left evidence of profound microscopic study as did Billroth, for example. In his exhaustive monographs on osteomyelitis, and he wrote two on the subject, Kocher relied upon the work of Tavel for the bacteriological data. In his work upon "Malignant Tumors of the Thyroid" and "Diseases of the Male Genital Organs" he called upon Langhans to do the work on the pathological anatomy. It must not be understood, however, that he underestimated the value of microscopic studies as he was instrumental in having the chair of bacteriology established in the University of Bern. It would rather seem that Kocher realized only too well his limitations together with his lack of special training and did not attempt to master all fields. No one, however, more quickly appreciated the value any other science might be to surgery, especially in the border sciences. His warm advocacy of Rollier in his inauguration of heliotherapy is but a case in point.

As an operator he was at once a revelation of skill and technical ability. Not a few of his Swiss patients declared he had a charmed hand and it seemed to be true. His technic founded upon a minute knowledge of applied anatomy, physiology and mechanical principles was a marvelous and a finished product. One looked in vain for grandstand plays and pyrotechnics. Slow, careful, absolutely sure of himself he never hurried or hesitated, it was never necessary; neither did he ever make a false or an unnecessary motion. His precautions against bloodshed and shock, his delicacy and gentleness in handling living tissue were almost a ritual and accounted in no small degree for his success. The same sense of security saturated the atmosphere of his clinic. Visitors were at once impressed by the utter lack of fuss and confusion so characteristic of many other clinics. It was, however, nothing more than the reflection of the master. Everything was so well-arranged, so logically and so consecutively planned, every detail so provided for that there never arose any need for hurry and bustle, and there was none.

In marked contrast to other European clinics, especially the German and Austrian, whose success was founded upon pathology, while the English and Scotch were interested primarily in anatomy, Kocher's work was established upon an anatomical, clinical and physiological basis. Constant study of histories and physical examinations, combined with the necessary laboratory data, supplied the clinical element and it is said that he had a small, private laboratory adjoining the surgical amphitheater where he constantly refreshed his knowledge of anatomy.

Although a charter member of the Deutsche Gesellschaft der Chirurgie (German Surgical Society) it was not until 1902 that he was elected president of that organization. Honors then came more closely. In 1908 he was made first president of the International Surgical Society, when they met in Brussels and later, in 1909 to be exact, he received the Nobel Prize in recognition of his work on the thyroid gland. Calls from other institutions were not wanting, Prague, Bonn, Vienna, Berlin, but these were declined, as Swiss patriotism, as proverbial as that of the Scot, prevailed.

His personality was at once enigmatical and engaging. He was ever the kind, courteous, considerate gentleman, retiring almost to the point of self-effacement. At the time of the anniversary of his seventieth birthday, for example, he requested that neither the students nor the university authorities celebrate the event publicly and while they acquiesced he could not restrain his friends or the newspapers, and the marks of appreciation and affection were all the more impressive because of their spontaniety. Another phase of his character little noted, but none the less part of the man, was his deeply religious nature, quiet, reserved, but nevertheless profound and sincere. It was part of his daily work and permeated his entire life. He not only believed but he lived his religion. None but his most intimate friends knew of the kindly humor and affection he possessed. While genial and affable to those who knew him best, it is regrettable that so few were privileged to see this side of the man. Unfortunately for him and the world he had none of the geniality or the universality of talents found in a Billroth, a Volkmann, a Virchow or a Horsley. Had Billroth not been a master surgeon he would have been known as a great musician. Horsley was politician and surgeon. Virchow was pathologist, anthropologist and political dynamo. But Kocher had few, if any, outside interests with the possible exception of tennis and drawing. His was essentially a one-track mind, devoted to surgery and to surgery alone. Even on trips to surgical conferences or on vacation tours he took with him notebooks and studies on a subject at that time attracting attention at the Bern Clinic. To posterity Kocher will be known as a surgeon and nothing else.

A man of medium height and frail stature his general appearance belied the tremendous nervous energy and physical strength demanded by his long and strenuous career. The clear, sharp blue eyes betrayed the keen, logical mind, while the long, tapering fingers bespoke the artistry displayed in all he did.

To Kocher teaching was at once a science and an art. As might have been expected he relied upon the immense fund of his personal experiences. He was master of his subject and that pupils came from all the world to learn new things and see wonders yet unknown never affected his composure. He combined the rare talent of clear expression with a well developed artistic sense and compelled his hearers not only to think but to reason with him and reach almost mathematical conclusions. Patient and considerate with honest effort, Kocher never could and would not tolerate indifference and ignorance, superficiality or laziness. Several points characterized his teaching. No one, for example, was more careful to get an exact, complete history of the patient; no one was ever more painstaking in his examinations. Every detail was followed to its logical conclusion and no hint was too slight to be ignored. His "Krankengeschichte" were models of accurate searching labor. At all times was Kocher extremely exacting as to indications for operating and only after every means had failed would he operate without an established diagnosis. It is said that he considered an exploratory operation equivalent to a diagnostic failure and it is remarkable how seldom he had to resort to it. Again, his teachings always carried the personal touch and it was on that account that his "Text-Book of Operative Surgery" (1892) met with such tremendous success. It was translated into French, Italian, Russian and Japanese and that Harold J. Stiles, the foremost Scotch surgeon of his time, saw fit to undertake the English translation speaks volumes for his appreciation of the work. The book is neither a compilation nor a review of other writers but is a refreshing account of personal experience and original work. And it is because of this personal element that the first is probably the best of the five editions. Here again his modesty crops out, for in order to avoid the appearance of egotism he wrote in the first person plural, a plan carried out in the English translation.

The many years' activity naturally sent forth men trained in his methods and enthused with his ideals. While the roll-call by no means comes up to expectations, it still is not inconsiderable. A partial list includes such names as Roux, (Lausanne); Lanz (Amsterdam); De Quervain, (Basel); Kummer and Lardy, (Geneva); Arnd, Albert Kocher, Matti, Wildbolz, v. Rodt, (Bern); Pettavel, (Neuchatel); Bernhardt, (St. Moritz); Rollier, (Leysin); Feurer, (St. Gallen); Fonio, (Langnau); Lauper, (Interlaken).

Anticipating Osler's advice to young men that they put their affections in cold storage, Kocher married at the age of twenty-eight years. He married Marie Witschi, the nineteen-year old, and at the time of her marriage, the only daughter of Johannes Witschi, a well known and influential business man of Bern. While her mother's people (the Courants) were of Huguenot stock, her parents were members of the Herrenhut Society (Moravian Brethren), a small religious body that came to Bern in the early part of the eighteenth century. The young Privat-Dozent and his wife lived for six happy years in Markt Gasse and then (1875), three years after he became professor of surgery, moved to Laupen Strasse where they lived for the next forty-two years. Three sons were born of this marriage and while one of these died in 1925 (the same year as his mother), the other two, both physicians, are practicing in Bern today. And it speaks well for both father and son that one of these (Albert Kocher) assisted his father in the Bern Clinic for twenty-one years. His home life was ever quiet, harmonious and happy. That not a little of this was due to the efforts of Mrs. Kocher need scarcely be said. Like the wife of that other great surgeon, Billroth, Frau Kocher contributed much to her husband's success by quietly regulating household affairs so as to relieve her husband of all distractions, entertaining his guests and friends and interesting herself in her husband's patients. No one will ever know how many a needy native was relieved, no one probably will ever know how many a homesick "Auslaender" was helped and cheered, while a patient in the hospital, by this angel of mercy. She was a companion in every sense of the word to her husband; she accompanied him on nearly all his trips, whether for recreation or to attend the numerous surgical association meetings. It has been well said that this was really more than a marriage: it was a life companionship between two rare and noble souls. She survived her illustrious husband for eight years and passed from this life, beloved and mourned by all, April 3, 1925.

He first deceased; she for a little tried
To live without him, liked it not and died.

Although Kocher by his many years of hard, unremitting concentrated work would surely have exhausted a more powerfully built frame, he never suffered any of the infirmities of age. Astounding as it may seem, for example, he never wore spectacles. Although afflicted with a severe gall bladder attack one year before his death, he fully recovered and resumed his daily routine work. He was fortunate in many respects, but, excepting his marriage, in none more so than that he died in the harness. He performed a gastric resection in the late afternoon of Monday, July 23, 1917; two days later uremic coma developed and he slept away, without again becoming cognizant of his surroundings, Friday, July 27, 1917.

How beautiful it is for a man to die,
. . . To be called
Like a watchworn and weary sentinel
To put his armour off and rest in heaven.

By his death Switzerland lost its leading citizen and medicine the greatest surgeon of that time. This material age, too prone to ask "what did he leave?" will be shocked to learn that money played a very minor rôle in Kocher's life. His life was devoted to his science and through that science to mankind. He seemed to regard himself as a high priest in a glorious calling dedicated to all that is highest and noblest. Seldom has a surgeon given so much of himself to alleviate the suffering of his fellowmen and if he left no great material wealth, he certainly left a heritage more precious than gold and silver. He left behind him a great and illustrious name, an enduring fame worthy of honor and respect wherever modern surgery is done.

If to define greatness is a hazardous adventure then certainly to discuss why a certain man is great must be doubly so; but as no paper of this nature can be complete without a discussion as to what made Kocher renowned, the following is offered as a suggestion.

It must not be forgotten that

Kocher began his career at one of the turning points in the history of surgery. It was the beginning of the antiseptic and aseptic period and he, by going to Lister's Clinic, early became thoroughly cognizant of the Lister method. It is to his credit that his keen foresight quickly apprehended the immense influence the then new method must have upon the future. It was his rare good fortune to quickly become the head of a clinic where he had ample opportunity to convert those ideas into realities. And while it may seem paradoxical, the fact remains that the Bern Clinic was comparatively a small one and that this also reacted to his advantage. Big things, and clinics are no exception, tend to become cumbersome, unwieldy and the responsibilities crush all initiative and demand all time available. Kocher's Clinic was never so large as to become a job, but it never was so small as to lack material for research and profound study. His unusually clear, quick, logical mind grasped the solution and the import of research problems while many another would have stumbled aimlessly through the mazes of vexatious theory. Like another thread of Ariadne his knowledge of anatomy, physiology and mechanical principles led him through the labyrinth of apparent contradictions and tedious hypotheses.

Another great, but seldom appreciated, factor was the character of the Swiss people. Not even the Viennese love for a "Wienerkind" can excel the feeling of comradeship, clannishness and affection of a Swiss for a brother Swiss. While not at all demonstrative they harbor the feeling none the less profoundly. They take a personal pride in the achievements and seem to have a share in honors won by any of their number. Their loyalty to their fellow citizens is sublime. It was but natural therefore that the Swiss should give Kocher the chance to prove his worth, to exercise his knowledge and skill, to support him long before the world had worn a wide path to the small town high among the magnificent snow-capped Alps. They believed in him always; not infrequently one of them would insist upon his performing a rather minor operation with the explanation, "Dir heit drum e so ne glueckliche Hand." Could one ask for faith more implicit!

Then, too, ninety-one semesters, forty years' residence at one clinic has many advantages, especially if that place be not too large and is yet the capital city. Accurate histories extending over forty years with a follow-up system that was almost perfection because of the settled state of the people and the smallness of the country, afford a bonanza of information as to operative results, duration of cure and other statistical data.

So much for circumstances independent of Kocher. To his credit let these facts be known. He possessed an insatiable thirst for hard, continuous, concentrated work, an infinite capacity for detail, an unswerving tenacity of purpose, an almost unheard of ability to submerge himself in a subject. His knowledge of anatomy, physiology and mechanical principles was exhaustive, his ingenuity in devising new operations was superb, his technic was irreproachable.

From the status of surgeon, "one whose duty it is to act in external maladies by (or under) the direction of the physician," (Johnson's "Dictionary," 1775) to the present proud, exalted seat of the modern surgeon is a far cry; but that such was possible within the brief past one hundred and fifty years is due in no small measure to the tireless and history-making labor of that quiet, modest unassuming gentleman, Theodore Kocher.

Centuries ago the Psalmist wrote: "Seest thou a man diligent in his business, he shall stand before kings," a truth nowhere better exemplified than in the life of that master surgeon and gentleman, Theodore Kocher. Of most surgeons it may be truthfully said,

> No one asks
> Who or what they have been,
> More than he asks what waves
> In the moonlit solitudes mild
> Of the midmost ocean have swelled
> Foamed for a moment and gone.

But in centuries to come no one can recall the history of surgery without recollecting with admiration, if not with veneration, the name of Theodore Kocher.

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RICHARD DEN'S TOMB

By JOHN W. SHUMAN, M.D.

LOS ANGELES, CALIF.

WE just saw Doctor Richard S. Den! It was one-fifteen P.M., August 1, 1930 when the stone was rolled away from the mouth of the tomb of that grand old Medico, Richard Somerset Den. He was the Nestor of California medicine. There were present a committee[1] of devotees to historical medicine to witness the glorious California sunshine bathing once again, the last Surgeon-General of the Mexican Army in California (1846–48) (Figs. 2, 3 and 4).

It had been more than thirty-five years since Den lived and practiced the art and science of medicine, for half a century in "Pueblo La Cuidad de Nuestra Senora La Reina de Los Angeles." He came to California via Australia after graduating from Dublin University (1843). A Francis Dixon, Dean of the Faculty of Physic, Dublin University writes[2] "the records here fail to disclose Den's name. It is possible that he attended as an extern student and may have taken the license of the Royal College of Surgeons and of the Royal College of Physicians. We will endeavor to trace him further." The Spanish gentry of early California so loved this red-haired Irish-Catholic medico that they called him Don Ricardo and coined this phrase concerning him, "Despues de dios, Doctor Don Ricardo," which translated meant, "After God, Doctor Don Ricard."

Doctor Den had much to do with the making of California pioneer medical history. He saw the Mexican flag retire before the flag of The Bear Republic (which lasted only twenty-one days). He also saw it give way to the Stars and Stripes.

He knew the "Argonauts" because he mined with them. He did not know golf, but he did know horses. His steeds were of the best in the West. The horse of which history tells the most, was the beautiful black stallion whose coat and silver mounted bridle and saddle glistened dazzlingly as his immaculately groomed bachelor rider guided him about as he made his medical and surgical visits.

Many tales about Den do not appear in the written historical records, for example, the incident of a realtor attempting to get him to connive in financially squeezing out a widow caught short in payment on a piece of property. The physician in characteristic he-man langugage ordered the real-estate man, "Out of this office and never speak to me again."

Prior to his death[3] the aged doctor prepared the tomb for his final resting place, tersely stating, "If I do not prepare my place of burial, none of my relatives will!" He knew human nature. None of his relatives showed any interest in the moving of his tomb when Figueroa Street was being pushed through to North Broadway, causing the old Calvary Cemetery to be moved to the new location on

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[1] Headed by Harlan Shoemaker, M.D. who has done much to bring to light California Medical History.

[2] Personal communication.

[3] He was found dead in bed. The coroner's inquest found after an autopsy, "Death from natural causes."

East Whittier Boulevard. However, this world renowned figure in regular medicine, who ranks with Pedro Prat, the first white physician to practice in California (1869) and with Pablo Soler, the great Spanish physician (1791), was not and is not without honor in his own country of adoption. The Los Angeles County Medical Association, at its own expense,[4] had the silver mounted iron casket, with its contents intact, moved to the new cemetery.

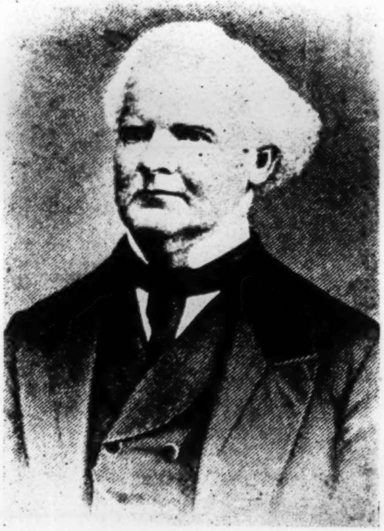

FIG. 1. DR. RICHARD S. DEN.

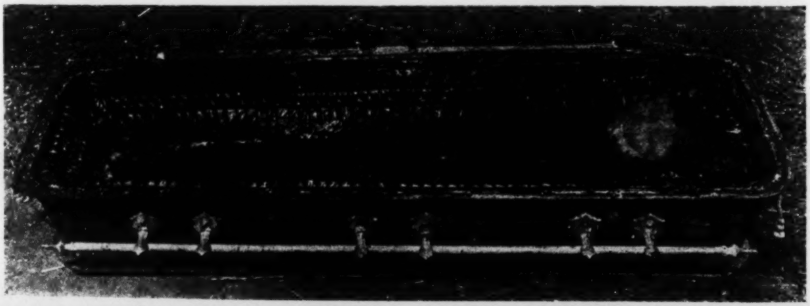

FIG. 2. FULL VIEW OF TOP CASKET AND ENSHROUDED REMAINS.

The long black shroud, draped Spanish-Catholic custom about the departed surgeon's remains, with black bow-tie, had lost none of its luster nor were its folds disturbed. The head swathings, when removed, disclosed the skull with its white-red thatch, and no great imagination was needed to recognize Don Ricardo from the photographs of the noble physician during life.

His wrists were bound together with

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[4] "Removal of Dr. Den's grave . . . $175.00." (*Los Angeles County Med. Bull.*, p. 56, 1930.)

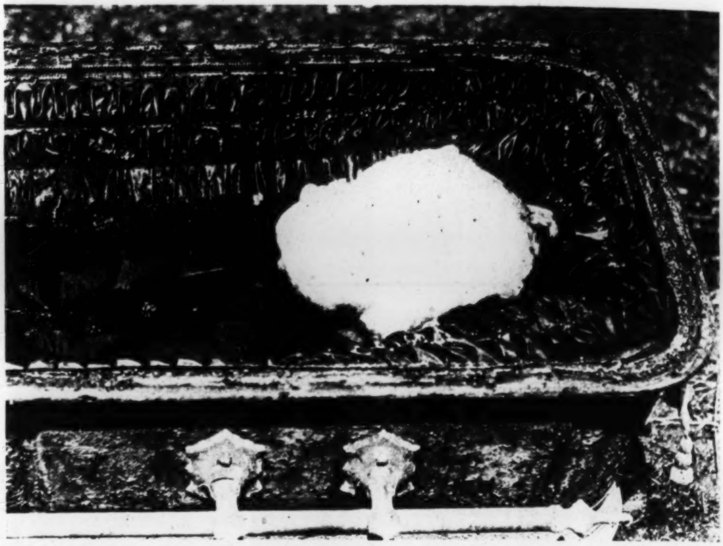

FIG. 3. CLOSE-UP. SHOWING COTTON SWATHING ABOUT HEAD. EMBALMING TECHNIQUE.

FIG. 4. UNSEALED.

a red bandana handkerchief, one upon the other, the right upon the left, and between the two was an octagon gold fifty-cent piece bearing the date of 1851. Also, in close proximity to his hands was a golf-ball-sized piece of gold-bearing quartz. Had some old "Sour-dough" whom Den had known during the days of his gold-rush experience and whom he had oftentimes grub-staked, paid his final tribute at the bier?

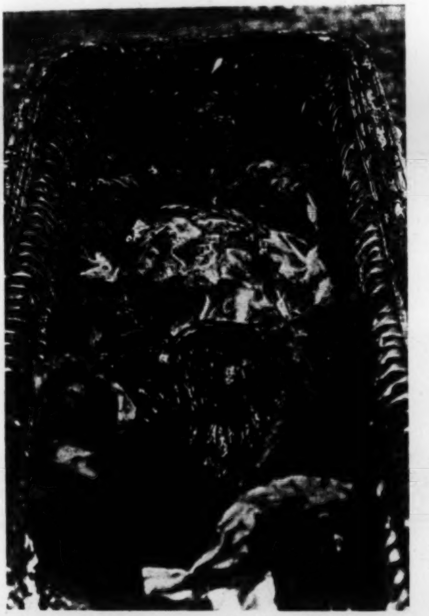

FIG. 5. CLOSE-UP AFTER SHROUD WAS REMOVED, SHOWING AUTOPSY INCISION THROUGH LEFT CHEST AND CLASPED HANDS.

The physicians of 1895 were conclusive in their studies because Figure 5 shows that an autopsy had been performed on the torso of the cadaver. Possibly Doctor Den requested that an after death examination be made because he was a scientific student of disease. It is also possible that he did not wish to be interred alive!

FIG. 6. A SKETCH OF THE MONUMENT WITH ITS INSCRIPTION ON THE GRAVE OF RICHARD SOMERSET DEN, M.D. CALVARY CEMETERY, LOS ANGELES, CALIF.

THE ADVENTUROUS GOLDBERGER*

By R. P. PARSONS, M.D.

WASHINGTON, D.C.

JUST how long a man must be dead before he can be properly considered a historical figure, and thus be discussed by historians who wish to observe the conventions of their guild, I am a little uncertain.

Joseph Goldberger died less than three years ago. But many of those who are familiar with his work and knew his personality have expressed their confidence that his name will be as well or better known three centuries hence as it was three years ago.

The permanence and prominence of a man's name in history are determined largely by such factors as the permanence and prominence of his work; that is, the number of years his ideas will influence the lives and thoughts of persons in the generations that succeed him; the number of persons affected by his work and the extent to which they are affected. If a man solves a problem, the greatness that eventually comes to him will depend upon the importance of the problem to the human race, and the amount of time and effort expended (unsuccessfully) on that problem by his predecessors.

While these criteria hold, Goldberger's qualifications for a permanent and high position in history should remain undisputed. The cause of pellagra was the puzzle of two centuries and the disease affected countless thousands of persons. Our knowledge of the nature of this disease was perhaps in a greater state of confusion in 1913 than it was in 1735, when Casal first described it and propounded his ideas as to its etiology. Goldberger's solution of the problem put an end to this confusion. His contributions form a solid basis for the prevention and cure of this disease and for the further study of other diseases associated with faulty diets. The influence of his work should be as far reaching and as permanent and important as were the influences of the work of Jenner and Pasteur.

I have mentioned pellagra only for the purpose of estimating Goldberger's historical position. The pellagra investigations were quite recent, having occupied the last fifteen years of Goldberger's life, and the world is rather generally, if vaguely, aware that a man named Goldberger had something to do with a disease called pellagra. It will therefore be more truly historical and perhaps more interesting to discuss some of Goldberger's earlier and less generally known work and something of the personal side of the man.

Goldberger was a man of many paradoxes. Outwardly he was cold as steel; a man of limitless patience; incapable of any human emotions; some thought him an extreme cynic—not that he was ever known to hold in derision or contempt the frailties of the human mind and soul or the follies of human institutions, but that he was thought to be utterly lacking in faith—and even any interest—in humanity. That was the outer Goldberger. It was not a conscious pose. It was simply the front that people saw, or thought they saw.

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* Read before the American Association of History of Medicine, Atlantic City, May 4, 1931.

The inner Goldberger was the real Goldberger, the Goldberger that his intimates knew so well. This inner fellow was the very intensely human Goldberger. The man was precisely a ten-year old boy, sharing all the emotions, showing all the impulses, feeling all the ecstatic joy or crushing disappointment that a normal boy can feel, sharing the boy's idealism, his imagination, his faith, his sense of romance, his optimism, his petty worries, his passions, his diffidence, and most of all, his craving for adventure. This picture becomes more strange when we add to the boyish emotionalism and idealism an intellect, a mental genius that never failed to astound those who were in a position to observe its technique and its effectiveness.

Goldberger with a new problem was emotionally the boy with a new pair of skates and intellectually Sherlock Holmes with a new murder mystery. There was always the boy's impetuosity with the restraint of the man's mind. The man's mind saying to the boy, "now keep your shirt on; don't get excited; I can see already that this path leads nowhere; neither does that one, nor that one; there can be only one logical tack to take at this point; this path must lead to the light; when you have seen it, you can prove the truth of it backward and forward and a hundred other ways. Then if you think it will give you any satisfaction, go ahead and announce it. Lots of people won't believe you, at least not at first, but that's neither here nor there; we have seen what we have seen, and we know what we're talking about or you may be dead certain we wouldn't be talking."

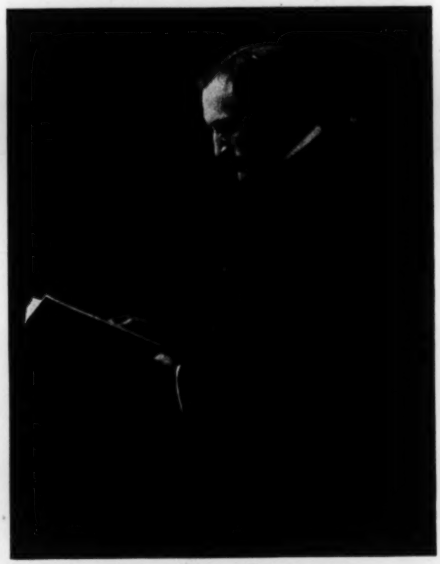

FIG. 1. JOSEPH GOLDBERGER.

Goldberger spent his life in the quest and enjoyment of adventure. Everything he saw suggested mysteries to be solved or dragons to be slain.

He was born in 1874, on a peasant tenant farm near Giralt, (then) Hungary (now Czecho Slovakia), just south of the Carpathian Mountains. In his infancy he heard the adventurous tales of America; tales that came by way of letters from former folk of the neighborhood who were getting on in the New World and substantiating the stories of their success by sending what seemed huge sums to be used in transporting the remaining portions of their families to America. Two of Goldberger's half-brothers were then carrying their packs of wares on their backs and peddling in the countryside around Cincinnati.

They were sending money as well as adventurous accounts.

In 1881, when Goldberger was seven, came the great adventure of the long voyage of the large Goldberger family to New York, made possible by the remittances of the half-brothers and the courage of the parents in converting all their resources into cash and burning all their bridges for the venture.

The father, Samuel, was something of a dreamer and religious mystic, but the mother, Sarah (Guttman), while also very orthodox in views and practice, had some hard-headed business sense. The eight children were immediately placed in an East Side public school; Samuel peddled in the streets of the Bowery and Sarah did some scheming. Before long they had a grocery store that catered to all creeds and races of the Pitt Street neighborhood on the lower East Side; it did a good business in sauerkraut and ham and spaghetti as well as in matzoth and kosher products. Joseph and his brothers were the delivery boys. Joseph was slow on the deliveries. He had a book under his coat. He would read it during the errands. He lived in his books. School books, story books—Alger, Optic, Cooper, tales of American frontier days. He spent every available moment with these books; he haunted the free libraries and second-hand book stalls.

His greatest reverence was for his school teachers; they symbolized knowledge, power, authority, guides to ways of life, guides to values in life.

At sixteen he entered the course of civil engineering at the New York City College. The career of a civil engineer would provide travel, adventure—and mathematics, his favorite subject in school. He progressed with ease and distinction in this school, standing fifth in a class of six hundred at the end of the second year.

The impressionable boy of eighteen chanced to attend the Harvey lecture, given in 1892 by Austin Flint, Jr., at the (then) Bellevue Hospital Medical College. That settled the engineering business. He immediately transferred his interests to medicine and entered the Bellevue Hospital school. In 1895 he graduated number two in his class and stood number one in the examinations for internship appointment at Bellevue.

At Bellevue he was known chiefly as a hater of routine and a master of case history writing. Routine without problems he of course found irksome. To him a case was a problem, an exciting mystery that must be solved, not a piece of routine. His case histories were models of perfection, held up as such by the visiting staff members for the other interns. Those case histories reflected their author's grasp of the clinical problem and his ability to present in a few plain words the essential data that pointed out the road to the diagnosis.

During the first fifteen years that followed his term at Bellevue he was profoundly influenced, often inspired, by a series of men with whom he became associated, just as later he himself became the inspirer of the younger research men who came to work with him.

At Wilkes Barre, where he engaged in private practice for two years, he came under the influence of Professor William Dean, a local professor of chemistry. Two year's conversation with this man persuaded him that private practice was not his field. It was drab. The Wilkes Barre period gave good promise of financial success in practice but that meant nothing to him. What good was money without adventure? There never was to be a day when he was entirely free from the exasperation of petty financial anxieties, but he was willing to forego the comfort of financial security if he could only find the other things he had been seeking. He wanted the sort of adventure which could scarcely be found in private practice.

At the beginning of the Spanish War he tried to enter the Navy Medical Corps. His application was ignored.

In 1899 he entered the Public Health Service. At his first quarantine station, Reedy Island, Delaware River, he was greatly influenced by his able chief, Farrar Richardson. Richardson gave him free reign, so that instead of being too oppressed by the routine, he could spend much of his time in devising improvements on the routine methods then in use.

He became interested in yellow fever. He was thrilled by the Reed experiments in Cuba and more thrilled by the previous observations of Henry Carter which directed the early course of the experiments of the Reed group. In 1902 he went to Washington and pleaded with Walter Wyman, then Surgeon General, for a job in Tampico, so he could study yellow fever. Wyman wanted to build up a strong research group. Goldberger got the assignment. He said he left for Mexico with all the intense emotion, the overwhelming joy of adventure that Marlow, of Conrad's "Youth," had felt when embarking for Bankok.

For five years he was engrossed in yellow fever, and happy beyond his wildest boyish expectations. He hunted down cases in various parts of Mexico, Porto Rico and our Southern States. He attained a masterly knowledge of mosquito life; he got one very "close-up" view of yellow fever by nearly dying of it in Mexico. He introduced new and lasting ideas in yellow fever quarantine. In this period he was largely influenced by his association with and tremendous admiration for Carter. He was also greatly influenced and inspired during the Mexican days by his friend, Neil Pressley, an American missionary at Tampico. Pressley and Goldberger called each other respectively, David and Jonathan.*

Goldberger exploded several false "discoveries" which were then being announced regarding the yellow fever organism. He exploded the announcement by Marchoux and Simond that the virus could be transmitted via ova to the offspring of infected mosquitoes. He became one of the world's authorities on yellow fever.

When the 1905 epidemic in New Orleans ended the story of yellow fever in the United States, Goldberger dropped the subject and took up parasitic worms. He spent five years in Stiles' department at the Hygienic Laboratory. Here he felt the constant influence of the association with such men as C.W. Stiles, G. W. McCoy, Edward Francis, W. H. Welch, M. J. Rosenau, and Reid Hunt.

To find adventure in a laboratory of helminthology would ordinarily require some play of the imagination. Simply following the old established methods of study would of course be quite unromantic. So Goldberger busied himself with devising a new and most ingenious technique for working out the detailed anatomy of a worm. By this method one can use the smallest worm and can develop a beautiful diagrammatic portrayal of its most detailed anatomy in any plane and on any scale. The technique is merely the application of some mathematics and the principles of mechanical drawing in such a way that serial transverse sections can be projected into a complete ventral or sagittal view, with all the systems of organs shown minutely throughout the whole length of the worm. Goldberger's two years' training in the civil engineering school doubtless served him well in this work.

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* I. Samuel 18:4. "And Jonathan stripped himself of the robe that was upon him, and gave it to David, and his garments, even to his sword, and to his bow, and to his girdle."

In the five-year period 1905–10 Goldberger became an accomplished zoologist as well as helminthologist and entomologist. In 1909, just before beginning his period of work at Woods Hole, he was called to Philadelphia to investigate the cause of a sudden epidemic of a strange and probably contagious skin disease. The disease had appeared in epidemic form in Philadelphia every spring since 1901 when it was first described by Schamberg. It was then known in America as Schamberg's disease, although it had frequently been reported in European literature during the previous sixty years.

The cause of the disease had remained a mystery. Goldberger's work in tracking down the responsible agent comprised one of the swiftest and neatest and most brilliant of all his investigations. Within forty-eight hours after his arrival in Philadelphia he had worked out the whole process of the epidemiology and held on a watch crystal the acarine mite (Pediculoidea ventricosis) of wheat fields and wheat-straw mattresses, the cause of what has since been called "straw itch."

No more than a mere mention of some of his other work can be included here. Most of it was developed as deliberate research at the Hygienic Laboratory* though a considerable part of it came out as by-products in the course of epidemics where he had been sent to aid the local health authorities.

At Woods Hole in 1909 he became well acquainted with H. T. Ricketts, and a few months later these two were again together in Mexico City during the typhus epidemic. Goldberger first showed that Mexican typhus and Rocky Mountain spotted fever are distinct diseases. Nicolle's work on the transmission of typhus in 1909 preceded Goldberger's by a few months but was then unknown to Goldberger. Quite independently he (Goldberger), in 1909, transmitted the disease to monkeys and demonstrated the transmission by the body louse. Incidentally, in 1910, Goldberger nearly died from typhus, and a few months later Ricketts was killed by this disease that has claimed so many victims from its investigators.

In 1910 he first showed that monkeys may be successfully inoculated with measles†. His measles experiments added greatly to our understanding of the disease and completely changed our ideas as to quarantine measures in measles.

In 1913, during the Detroit diphtheria epidemic he demonstrated the diphtheria carrier incidence in large cities during epidemic and nonepidemic years; and introduced several improved methods for carrier detection, carrier surveys and carrier control.

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* Now the National Institute of Health.

† Hektoen attempted the inoculation of monkeys with measles in 1905 and probably succeeded although he then interpreted his experiments negatively.

In 1914 the great pellagra adventure began, but that is another story, and a very long story.

When he received the news of the assignment he was so discouraged over the poor prospect of success that he wept like a child, as he had wept on several previous occasions when he thought he might be wasting time. This was the man that people thought was the cold, dispassionate Goldberger. The man with the piercing mind that cut cleanly into the innermost secrets of Nature; a piercing mind, indeed, but the heart of a boy that could feel, and could cry and laugh. The boy of impulses and ideals. A very old scrapbook of Goldberger's contains on its first page a little poem, which, I think, symbolized his whole philosophy of life and work:

Better to hold a high belief
Though that we hold to ne'er may be;
Better to do, through life so brief,
Though noble toil no fruit shall see.

[From Boyle: Opera Omnia.
Venetiis, 1697.]

THE NAMING OF ALOPECIA AREATA

By DOUGLASS W. MONTGOMERY, M.D.

SAN FRANCISCO

BESIDES the intrinsic value attaching to the names of diseases their contemplation is often of interest as throwing into relief a feature that might otherwise escape our notice or be accorded insufficient value. Appellations may remind us also of how our predecessors regarded this or that affection, and what treatment and precautions they took against them. Alopecia areata for instance has had a number of names, all of them interesting in recalling some point in its history, appearance or nature. The nomenclature of this remarkable affection also serves to recall the bitter strife that centered about the question of its contagiousness, a strife that lasted for years, until finally cleared up by Sabouraud.

This disputation was limited to physicians and scientists of the western edge of the Eurasian Continent, principally to France with repercussions in Germany and to a lesser extent in England, with very little movement in America. The genius of our people runs rather in strife on social and economic questions with theological, educational and monetary implications. We rarely grow heated, as do the French and Germans, over scientific or medical questions, although we may become deeply interested.

The name, alopecia areata, is now given to a distinct type of patchy baldness, of which the obvious symptoms are a sudden loss of hair in a circular or oval area, leaving a startlingly white, smooth, perfectly bald surface unaccompanied by any evidences of inflammation. The less obvious symptoms are that the surface appears to be slightly depressed, due to the loss of thickness of the scalp occasioned by the loss of hair, and also there is the presence of a number of short hairs surrounding the central bald spot. These hairs are easily extracted, look dull and lusterless and are club-shaped, and so deserve their very descriptive name of "exclamation mark" hairs. They are obviously atrophied. After a longer or shorter time the lost hair is restored in its integrity.

Few diseases are simpler in symptoms, and few are freer from discomfort, and few indeed have a better prognosis, and yet few give rise to more anxiety. This anxiety arises from the sentimental regard we entertain for the small area of hair covering the top and back of the head. The afflicted one fears that the whole decoration may vanish, especially when other patches follow the first, which not seldom occurs. This affection has never been endowed with a vast number of names as was syphilis for example, with its hundreds of appellations. In chronological order it has been called alopecia with a subvariety: ophiasis area, area Celsi, alopecia areata, porrigo decalvans and la pelade.

ALOPECIA

The name, alopecia, the fox disease, occurs in the works of Hippocrates. Everything seems to hark back to that wonderful people, the Greeks.

Bridges has remarked: "There is now no higher intellect to brighten the world than little Hellas owned."[1] The name designated patchy baldness, and is said to have arisen because foxes have patchy bald areas from the mange and because of rubbing to relieve itching. Another view is that it came from an old saying: "No grass grows where the fox urinates." The latter derivation is, however, considered unlikely by Paul Richter.

Besides alopecia, there was, as mentioned before, another Greek name, ophiasis, the snake disease, said by some to be so called from the baldness produced having a wavy outline. But Paul Richter ascribes it to the analogy of the snake casting its skin.[2] Both names therefore refer to scurfiness and desquamation as well as to baldness, and lend themselves to the perpetuation of a belief that this form of baldness is of the same nature as those of inflammatory origin. In fact the term, alopecia, possibly included all kinds of patchy baldness, and both alopecia and ophiasis were probably folknames.

Now the term, ophiasis, is restricted to that form of alopecia areata of the occipital region in which the patches tend to coalesce and to spread clear across the back of the head. Because of the coalescence of the circular patches the margin is wavy, as before adverted to. This form is particularly refractory to treatment, and is therefore worthy of a separate name. This tendency to associate alopecia areata with certain desquamative diseases, and to regard alopecia as a contagious disease endured down to the time when Sabouraud definitely separated the smooth alopecia areata from the roughened inflammatory infectious diseases that also cause patchy baldness.

THE NAME AREA, OR RATHER AREAE, GIVEN BY CELSUS

As we shall see, Celsus' name for the patchy baldness we now call alopecia areata was most apt. He, however, recognized two kinds of patchy baldness: *arearum duo genera sunt*, and this statement also has its peculiar interest as certainly indicating that he considered it a dual disease. The aptness of Celsus' name for alopecia areata will be appreciated if one considered what the word, area, usually meant in his day. He lived in Italy at the beginning of the Christian Era (25 B.C. to 50 A.D.), and was contemporary with Virgil (70–19 B.C.), that is to say, he probably was born when Virgil was forty-five years of age.

Virgil's works quickly became popular and, what is more apposite to us, they were quickly adopted in schools and by grammarians as textbooks, and have remained so ever since. And consequently ever since, all down through the ages, Virgil's works have been illuminated by boys' reddened buttocks, and it may have been that Celsus' pair also served to brighten his pages. Virgil's employment of the word, area, would therefore give a fair idea of its ordinary use. He employs it five times, in four of which it means a threshing floor.[3] In one place he gives a detailed description of how an area was made. Tough clay well worked up in the hands was spread out on the ground and levelled off with with a roller so as to obtain a smooth hard surface, secure against burrowing animals and the injuries of the weather. On this the mowed grain, or as we say in California, headed grain, was scattered, and threshed out by hauling over it with oxen a heavy sled or a heavy truck with low wheels. The straw was separated by forking it off, and the chaff by winnowing. I have only seen this primitive mode of threshing once, in Burgos, in Old Castile, Spain, and an interesting sight it was to one coming from a highly mechanicized country like the United States.

The area therefore was a more or less circular, glaring white, smooth surface. In Italy, where it seldom rained in the threshing season it was laid in the open air in the fields, and not in a barn as it would be in a rainier country. It was by preference situated on a slight elevation so as to catch the breeze for winnowing, and from this circumstance and from its color and baldness was sharply marked off from the surrounding greens and browns. One can see how appropriately Celsus could transfer the term as a descriptive name to the disease, alopecia areata, which also shows a circular, dead white, smooth area well marked off from the surrounding scalp provided with its normal coat of hair.

Horace also uses the word, area, in the same sense as Virgil in at least one place, *campus et areae*, the field and the playgrounds. The word is therefore here linked up with the open country, and one can see what a fine place the threshing floor would be for some of the games of children.[4] Hence their name, playground.

There is yet another feature common to both. The area, threshing floor, may become, as Virgil says, cracked and dusty, and in the tonsure producing ringworm, tinea tonsurans, the bald area is rough and powdery, which is a major distinguishing symptom, never to be neglected, between alopecia areata and ringworm, and may correspond with the two areae mentioned by Celsus. This powderiness on the one hand and absolute smoothness on the other rests in the very nature of both affections, as one is a trophic disturbance devoid of inflammation or any of its products, and the other has all the dustiness and detritus of a fungus ploughing through and under the superficial epithelial cells.

In considering the relevancy of names it is well to reflect that in ancient medicine they had much greater practical significance than with us. A name was supposed to convey a real indication of the nature of the object named, and indicated intrinsically how for instance a disease should be regarded or treated. In fact, in theology in St. Paul's day the name, Word, or Logos, had advanced to the supreme position of the sole object of worship, and this reverence tinged all literature, and had its effect on the science of medicine.

The deification of the Word is one of the most curious developments of human thought. It is clearly stated in the New Testament, as in the verse: "In the beginning was the Word, and the Word was with God, and the Word was God."[5] It was this verse Goethe employed so cleverly to illustrate the difference in scholastic outlook between the Middle Ages and modern life: "On the one hand undue reverence for tradition and on the other the accumulation of facts (*die That*), and the investigation of energy (*die Kraft*)."[6]

The fundamental law of the ancient "Speech Philosophy" according to Edouard Noorden is expressed by the formula: "Words are the images of Things." The father of the idea was

Heraclitus (died about 480 B.C.) whose λόγοι was the result of this conception.[7] We, with our bilingual speech, cannot obtain the same clear idea of the objectivity of a noun as could the Greeks, or as now can the Germans, with whom a noun is self-defining. This is clearly indicated by our constant use of the dictionary, while with the Germans a dictionary is not a desk companion at all.

This Greek conception of the divinity of the Word met the reverence for the written word of the Jews, which began, according to Sir J. G. Frazer, in 621 B.C., under the reign of King Josiah, with the acceptance of the laws in Deuteronomy. Under this conception the human mind was tightly shackled for centuries, and its influence is still plainly felt.[8]

The idea that a name has something mystic in it is still frequently encountered in a modified form, as patients will often ask for the name of their malady and be quite satisfied with the name, and books are still written with the name of a disease followed by a list of remedies with a lofty disregard of the nature of the affection or of the circumstances. Besides the mystic value attached to a name the ancient physicians, like the poets, were fond of similies and metaphors, and moreover the doctrine of similars, a doctrine prevalent in ancient medicine, had a great influence on the practice of medicine. For example the yellow color of rhubarb was supposed to be cause of its action on the liver. Therefore calling a bald patch on the scalp a threshing floor undoubtedly meant more to them than it would to us. The cruder similarities were then of course the only ones available. Now we have chemical and microscopical and a host of other similarities permitting an equal number of classifications, of which the Ancients had no conception whatever.

Celsus' works had a great vogue for hundreds of years, and this disease came to be known as area Celsi, a name that is still frequently employed.

Later Jerome Fracastor classified "areae" among the diseases capable of causing infection by contact, and of which the germs could be transmitted by a fomite.[9] This man, writing shortly after the discovery of America by Columbus, still retained the name, areae, and just as Celsus did, employed it in the plural. Evidently the old mistake was being made between the tonsure producing ringworm, and probably also other diseases producing patchy baldness, and alopecia areata.

THE ORIGIN OF THE TERM, ALOPECIA AREATA

We now come to Johannes Jonston (born in Samter, 1603, died in Liegnitz in the province of Posen, 1675) who in a work on external diseases published in 1652 included a chapter on the fall of hair (*casu capillorum*) and spoke of the areated fall of hair (*capillorum areatim defluvium*). From this Sauvages constructed the term, alopecia areata.[10] This is the first appearance in literature of this term in its entirety.

PORRIGO DECALVANS AND LA PELADE

Tenneson in his delightful book on diseases of the skin has given a further account of some of the titular adventures of this disease.[11] As is well known Willan and Bateman, preceded it is true by Plenck of Vienna, in the later years of the eighteenth century instituted a classification of diseases of the skin based on the primary lesions such as papules, pustules, etc., which was a great advance on any previously in use. In doing so they changed the meaning of many of the ancient terms. Porrigo usually had previously been employed to designate, more or less loosely, seborrheic patchy baldness. Bateman now applied it to the disease under discussion, of which he gave a good description. There was a flaw, however. The Willan and Bateman system demanded that there should be some kind of primary lesion present in all diseases of the skin. But in alopecia areata none of these lesions is present. So, like many other systematizers, when they saw that the facts did not fit they, according to Feulard, changed the facts, and asserted that minute vesicles could be found at the points of emergence of the hairs at the periphery of a patch. Sabouraud, while admitting the truth of Feulard's hypothesis, draws attention to the fact that Willan and Bateman could have easily seen minute vesicles and pustules in the patchy alopecia of impetigo contagiosa.[12] The old mistake therefore was again made of considering alopecia areata a contagious inflammatory disease. For some years after this, down to David Gruby's day and beyond, the disease was known as porrigo decalvans.

On settling in Paris, Gruby found an opening in an orphan asylum, and with characteristic energy and good sense began to work on the material at his hand. He made a series of brilliant discoveries of fungous parasites on the skin, such as the achorion of favus in 1842, the trichophyton in 1844, and the microsporon audouini in 1843. This last causes circular tonsures on the scalp in children. The resultant circular patch is, however, not smooth and white, but is scurfy and dusty looking. Gruby (1810–1898) was not a trained dermatologist, nor did he ever have much enthusiasm for diseases of the skin, but he was a wonderful draftsman and drew most accurate pictures of what he observed under the microscope, and from mental habit and because of his excellent eyesight had full confidence in what he saw. His lack of training, however, prevented him from noting the difference between what was then called porrigo decalvans (our alopecia areata) and tinea tonsurans. He found the fungus in tinea tonsurans in the children in the hospital, and thought it should also be present in alopecia areata. Bazin,[13] his contemporary and fellow townsman, then took up the subject of the parasitic fungi with the enthusiasm of a recent convert, and unreservedly declared both alopecias, tinea tonsurans and alopecia areata, to be due to the same fungus, and both to be contagious. He called the smooth bald variety la pelade, a name derived from the tanning industry. La pelade is the wool or hair derived from cleaning off the hides of sheep or goats. It will be remarked that the word therefore originally referred to the wool or hair taken off, and not to the "bald" skin. Nevertheless the word fitted in so delightfully with the genius of the French language that it quickly became a favorite, and is the name now universally employed in France, and only in France. It has never gained a footing elsewhere.

To resume: The first names for this disease of which we have a record were given by the Greeks, alopecia and ophiasis. Celsus later employed the term, areae, written in the plural, and from this was derived the term, area Celsi, but as was usual in medieval medicine without any close definition. The adverb, areatim, was employed by Johannes Jonston in 1668, and Sauvages later described the affection exactly, and called it area de Jonston, or alopecia areata, which is now everywhere in use except in France, where the term, pelade, prevails.

Willan and Bateman called the disease porrigo decalvans, but in endeavoring to fit it into their classification made it a vesicular disease, and incidentally linked it with impetigo contagiosa. Nevertheless they described the disease well.

Gruby, through lack of training in diseases of the skin, and Bazin, through enthusiasm for Gruby's discoveries, classed alopecia areata among the fungous diseases of the skin, confounding it particularly with tinea tonsurans, and regarded it as being contagious.

For years the strife in regard to the mycotic diseases went on, and gradually those that were not mycotic were separated from those that were, but many still clung to the belief that even if fungi were not discovered in alopecia areata, yet the disease was contagious. Tenneson, a man noted both for his learning and for his clinical ability, wrote in 1893 the amazing sentence: "La pelade est aussi manifestement contagieuse que la rougeole et les oreillons." (Alopecia areata is as definitely contagious as measles or the mumps.)

In the course of his admirable investigations Sabouraud showed the correctness of Gruby's description of the Microsporon audouini, and its inevitable connection with tinea tonsurans, and the distinction between this disease and alopecia areata. So now we have alopecia areata a noninflammatory disease affecting the hair, and which is not contagious, and tinea tonsurans which is inflammatory, and which is highly contagious to children below fifteen years of age.

The foregoing history would be a vain literary exercise were it not to serve the purpose of drawing attention more interestingly to the clinical history of this remarkable affection than a mere enumeration of the symptoms can.

This history serves also to show how men we all recognize for their ability and learning, such as the late H. Tenneson, by not considering details or through prejudice may commit grave diagnostic errors. Sabouraud, however, has demonstrated that the disease, alopecia areata, called in France la pelade, is a clinical entity apart, and that it is not contagious, and does not give rise to epidemics. And he also has shown that the epidemics of patchy baldness attributed to it are derived from other causes as tinea tonsurans or impetigo contagiosa.

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[From Redi: Sonetti. Firenze, 1702.]

THE RELATION OF PHYSICIANS TO EARLY AMERICAN GEOLOGY

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THE part taken by physicians in the genesis of the natural sciences has long been remarked. Their share in the development of such lines in this country is worthy of consideration. A similarity in primogenesis of the sciences here and at large is the more natural as they were not simply transplanted but in varying degrees further developed. Especially in geology the necessary application to indigenous conditions and the rapid advance of the subject at that period made its origin here comparable to that of a new science.

It is from the historic point of view, rather than from any special knowledge of geology, that the subject is here approached, though every intelligent person can find interest in some phase of the science.

The study was not foreplanned, but originated from casual items in the Osler honor volumes (1919). A fuller outline was given in an address, Dec. 29, 1928, in "The History of Medicine and Civilization" program of Section N (A. A. A. S.) at the New York, Academy of Medicine, published elsewhere without correction. It is hoped now to present the matter with reasonable completeness, so far as known material goes.

The era of these practical workers with a medical background has now lapsed, barring an occasional instance. The chapter is therefore ready for record. In no other branch can such a movement be worked out with more mathematical exactness. It is, as noted, but part of the larger one of *medical pioneering in the sciences*. Medicine has been termed "Mother of the Sciences," which fits in very well, as Maclure, a non-medical Scot, is sometimes called the father of American geology; though, if medico-socialistic not to say communistic upheavers progress, the juniors may become even less proud of the old lady.

The instances so far found of this double form of professional training are, as follows, the names arranged chronologically according to date of birth. Of course these men did their geologic work years later. Many of the names are so well-known that only brief mention is necessary. More details are hence given of those whose sketches in biographic works are imperfect or wanting, or whose relation to this field is little noted.

1. William Baylies, A.M., M.D., 1743–1826, *b.* Mass. *P.*,* (called Wm. A. by Merrill). Under date of July 1, 1786, he examined and described, in "Memoirs of the American Academy of Arts and Sciences," Boston, 1793, II, the formation known as Gay Head, Martha's Vinyard, though his inference as to its igneous origin was later disallowed. He made a special expedition to the Island for this purpose.

Member of Provincial Congress (1775), state senator and United States Congressman (1805–09). (I, V, VI, IX.)†

2. Johan David Schoepf, M.D., 1752–

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* *P.* means practitioner at some period.

† Appended numbers, in parentheses, indicate references at end of article.

1800, *b*. Germany. *P*. His "Beyträge zur mineralogischen Kentniss des oestlichen Theils von Nordamerika & seiner Gebürge," Erlangen, 1787, "is commonly regarded as the first systematic work on American geology." Also wrote, "Materia medica Americana," Germany, 1787. Schoepf's "Reise &c.," translated by Alfred J. Morrison. 2 vols. Philadelphia, 1911.

He came to America in 1777 as surgeon to the Hessian troops, and travelled here after the peace of 1783. He received the title of Geheimer Hofrath after returning home about 1784. (V, XIII. Also Hirsch's Biographisches Lexicon. And *Bull. Geological Soc. of America*, 1894.)

3. Thomas Cooper, M.D., LL.D., 1759–1840, *b*. England, lecturer on geology, publicist, chemist; Professor of Mineralogy and President of South Carolina College. In 1802 an article on volcanoes. (I, IV, VI.)

4. Hon. Samuel Latham Mitchill. M.D., LL.D., 1764–1831, *b*. Long Island, *P*. As State Commissioner he made a geological survey of eastern New York.

Wrote "Observations on the Geology of North America," 1818.

Said to have discovered the first fossil horse (*v*, Osborne).

President American Mineralogical Soc., 1799. Professor of Natural History, etc., at P. & S. As editor of the *Medical Repository*, 1797–1820, he provided the first channel here for geologic papers, showing thus the close relationship of those lines at the time. United States Senator.

(IV, VI, *Pop. Sci. Monthly*, I: 691–6, 1891.)

5. Horace Henry Hayden, M.D., 1768–1844, *b*. Connecticut, *P*. "Geological Essays," 1820, said to have been the first general work on that subject in America; collector; president of Baltimore College of Dental Surgery; botanist. A mineral was named for him.

(I, IV. And "The Medical Annals of Md." Baltimore, 1903.)

6. Samuel Brown, A.B., M.D., 1769–1830, *b*. Va., *P*. Studied partly in Edinburgh. Professor of chemistry, etc., at Transylvania Univ., Ky. "A leading geologist of the State, and published numerous articles in Silliman's *Journal* and the *American Philosoph. Transactions*," and one of a cave on Crooked Creek, Ky., in *Am. Mineralogical J*.

(I, V, X for 1923, p. 387.)

7. James Mease, A.M., M.D., 1771–1846, *b*. Phila. *P*., "first American antiquarian," wrote "A Geological Account of the United States." (Philadelphia, 1807.)

(I, V. Also "Eminent Philadelphians," 1859.)

8. Gerard Troost, M.D., 1776–1850, *b*. Holland. *P*. "Stratigraphic geologist." Professor of Mineralogy at Philadelphia Museum. President, Academy of the Natural Sciences.

State geologist of Tennessee (1831–47). Professor of chemistry, geology and mineralogy at University of Nashville.

His cabinet of specimens sold for $20,000 to Louisville Public Library.

(IV, XIII.)

9. Archibald Bruce, A.B., M.D., 1777–1818, *P*. *b*. New York City. Published the first *American Mineralogical Journal*. Professor of materia medica and mineralogy in the College of Physicians and Surgeons. Collector.

(I, V, IX.)

10. Benjamin Silliman, Sr., M.D., LL.D., 1779–1864, *b*. Conn. Professor of chemistry and geology at Yale. "He made a geologic survey of part

of Connecticut, which is believed to have been the first similar exploration in the United States." "Did more to advance the science of geology than any other man of his day" in America. Silliman professorship of Geology at Yale named for him.

(IV. Alumni Catalogue.)

11. John Millington, M.D., 1779–1868, *b.* England. Professor of Natural Philosophy at Guy's Hospital. Mine manager in Mexico, 1827–35. Professor of Chemistry, etc., at William and Mary, 1835–48. Professor of Geology and Agriculture, University of Mississippi, 1848–53. State geologist of Miss.; 1 report in 1850. Professor at Memphis Med. Coll., 1853. Wrote on gold mines in Va., in *Trans. Geological Soc. Pa.*, 1: 1835.

(v, XV. Biography by Prof. G. F. Holmes in *Wm. & Mary College Quarterly*, 23–35, 1923.)

12. Parker Cleaveland, Jr., M.D., LL.D., 1780–1858, *b.* Mass. "Made a geological and mineralogical survey of part of New England," wrote "Mineralogy and Geology" (1816), Professor at Bowdoin and Dean of Medical School.

(I, IX.)

13. Dr. John Steele, 1780–1838, *b.* Mass. "Physician and Scientist of Saratoga Springs." Wrote "Snake Hill and Saratoga Lake and its Environs," 1825; President of New York State Medical Society.

(v. Also Stone's "Reminiscences of Saratoga," 1875.)

14. Robert Hare, M.A., M.D., 1781–1858, *b.* Pa. v. President of American Geological Society in 1819. Had various geologists as students.

Experiments "on anthracite, plumbago, & c." *Am. J. Sci.*, 1825. Professor of Chemistry at University of Pennsylvania. Inventor of blow-pipe. Meteorologist. Rumford medallist.

(I, XIII.)

15. Samuel Prescott Hildreth, A.B., M.D., 1783–1863, *b.* Mass. *P.* On the geologic survey of Ohio. Wrote on soft coal deposits and geology of the Ohio Valley. "For nearly forty years he contributed to Silliman's *Journal* on meteorology and paleontology." Historian.

(I. V. IX.)

16. Chester Dewey, M.D., D.D., LL.D., 1784–1867, *b.* Mass. "Botanist, geologist, chemist." Wrote much on the geology of New York State and Western Massachusetts.

"Mineralogy and geology of the Vicinity of Williams College" in *Am. J. Sci.*, 1: 1818,

"Taconic Range &c." *Ibid*, 1820. Mammoth, *ibid*, 1838. Geology of Berkshire County, 1829.

Professor of Chemistry and Natural Sciences at the University of Rochester, and Berkshire Medical College.

(I. V. XII.)

17. Samuel Akerly, A.M., M.D., 1785–1845 *b.* N. Y., *P.* Wrote "A Geological Account of Dutchess County, N. Y." in *Am. Minerol.* J. of 1810. Also wrote "On the Geology of the Hudson River Valley & Vicinity" (1820–29). A charter member American Geological Society in 1819. Brother-in-law of Mitchill. (No. 4 *supra.*) American editor of Hooper's Medical Dictionary.

(v, XI. And Columbia Alumni.)

18. John Locke, M.D., 1792–1856, *b.* Maine. *P.* on geologic survey, State of Ohio and northwest territory of United States. Professor of chemistry at medical college of Ohio, botanist; President, American Association of Geologists.

(I. Also, "Life & Character," by M. B. Wright, M.D., 1857, Cincinnati.)

19. James Ellsworth DeKay, M.D., 1792–1851, *b.* Portugal, of American parents, *P*, in New York City, and later lived on Long Island. Prepared five zoölogical volumes for the first New York State Geological Survey. Also, "Geology of Trenton Falls," 1823. And on drift boulders, 1828.

(IV, V, VI.)

20. Jared Potter Kirtland, M.D, LL.D., 1793–1877, *P.*, *b.* Conn. On first geologic survey of Ohio, and "prepared a report on the geology of the state"; naturalist; Professor medicine in Cincinnati and Cleveland. His collection started the Museum of Natural History in Cleveland.

(I, XI.)

21. James Gates Percival, A.B., M.D., 1795–1856, *b.* Conn., *P.*, state geologist of Connecticut and Wisconsin; Professor of Chemistry at West Point. Explored lead mines in the West. Poet.

(I, V, XVIII, Nov., 1856.)

22. Samuel Luther Dana, M.D., LL.D., 1795–1868. *P.*, *b.* New Hampshire. With his brother wrote, "Outlines of the Mineralogy & Geology of Boston," 1818. Wrote also on lead pipe, on lead poisoning, and on soils. Consultant on Boston and New York water supplies. "Analysis of Coprolites," XVIII, 1845.

Founded Newton Chemical Co. Chemist of the Merrimac cotton mills in Lowell. Entomologist. Collector.

(IV. "Old Residents' Historical Assoc." Lowell, 1879, I: 265 et seq., with photograph.)

23. Richard Harlan, M.D., 1796–1843, *b.* Philadelphia, *P.* Naturalist; "vertebrate paleontologist," Professor of Comparative Anatomy at the Philadelphia Museum. "Memoirs" &c. (scientific), 1835. (XIII.)

24. Edwin James, A.B., M.D., 1797–1861, *b.* Vermont. Geologist and botanist to Long's 1819–20 Rocky Mountain Expedition. Wrote much on geology of Mississippi Valley; also on sandstones, limestones and trap rocks.

Surgeon United States Army.
The first to ascend Pike's Peak.

(I, VI, VIII, XVIII, 1862, 428–9.)

25. Dr. James Eights, 1798–1882, *b.* New York. Geologist, explorer, artist.

Naturalist of the United States. "Exploring Expedition of 1830." "Eights' geological observations were the first ever made in the antarctic." "Remarks on the South Shetland Islands," 1833.

"Geological Features of the City of Albany and Vicinity," *Trans. Albany Inst.* 1852.

"Geologic examination of Mitchell's Cave, N. Y.," 1848, in *Am. Quart. J. Agriculture*, etc.

(I, IX. And *Scientific Monthly*, 1916, Feb., "Reincarnation of James Eights," by Dr. John M. Clarke.)

26. Lewis Caleb Beck, A.M., M.D., 1798–1858, *b.* N. Y., *P.* Wrote "The Gazetteer of Ill. & Mo." 1822. Also "The Salt Springs of Salina," 1826. On the seven year geologic survey of New York., and wrote a book on the mineralogy of the state, 1842. Professor of Botany, Chemistry and Natural History. Collector.

(I, XIII. And volume I, 1854, of *Annals of Albany County Med. Soc.*)

27. Samuel George Morton, M.D., 1799–1851, of Philadelphia. "Leading stratigraphic paleontologist." Wrote "Organic Remains in cretaceous Rocks" 1834; Professor of Anatomy; ethnologist. (I, XI.)

28. Ebenezer Emmons, A.B., M.D., 1799–1863, *b.* Mass. Wrote a "Manual of Geology," 1826, and 1860. Author

of "Taconic System." Professor of geology at William's College. State geologist of New York and North Carolina.

A tablet was placed in 1901 on his old home in Albany where "the first formal efforts were made, in 1838 and 1839, toward the organization of the Association of American Geologists, the parent body of the A. A. A. S."

(Biographic Cyclopaedias. II, 1924, 365.)

29. Wm. Byrd Powell, A.B., M.D., 1799–1867, *b.* Ky., *P.* State geologist of Arkansas; collector of crania; Professor of "Medical Geology" &c. in Kentucky, Eclectic. (I, V.)

30. James Dean (or Deane), A.M., M.D., 1801–58, *b.* Mass. *P.* Discovered, described and illustrated the fossil footprints of Connecticut Valley sandstone in many memoirs, first in 1835. (I, XIII.)

31. Ezekiel Holmes, A.B., M.D., 1801–65, of Winthrop Maine, *b.* Mass. *P.* "Geologist & naturalist."

A survey of Aroostook River region, 1838.

"Notes on the Geology of Maine." 1860.

Head of state survey of Natural History and Geology of Maine. Preliminary report, 1861. Second part, 1862.

Editor of *Maine Farmer.*

Professor of natural history at Waterville College (now Colby).

"Holmes Cabinet," and a Hall at the University of the State of Maine are named for him.

(v. Also History of Kennebec County. A fine portrait in "History of Winthrop," 1925.)

32. Amos Binney, A.M., M.D., 1803–48, *b.* Mass. *P.* Naturalist, conchologist, merchant. A founder of the American Association of Geologists. President Boston Society Natural History.

His chief work here was in 1848, "Some geologic features of Natchez, on the Miss.," in which he described fossil shells, and called the enclosing formation "analogous to the Loess of the Rhine." (XIII, XV.)

33. Chas. Upham Shepard, M.D., LL.D., 1804–86, *b.* Rhode Island. On the Connecticut State Geological Survey; also Illinois; collector of minerals and meteorites; Professor of Chemistry and Natural History at Amherst. (I, IX.)

34. Robert Peter, M.D., 1805–94, *P.*, *b.* England. On geological surveys of Kentucky and Arkansas; wrote, "Relation of Forms of Disease to Geological Formation of Region"; Professor of Chemistry and Dean at Transylvania University, and of the Kentucky Medical School. (I, V.)

35. Henry King, M.D., of St. Louis, *b.* before 1805, *d.* before 1863. Headed charter members of Western Academy of Natural Sciences, St. Louis, 1837.

"Report of a geological Reconnaissance of part of the Missouri River, adjacent to the Osage River," 1839 (1840–41).

"Directions for making Collections in Natural History [largely devoted to fossils], prepared for the National Institution for the Promotion of Science." D. C., 1840.

"Position of lead-bearing limestones of the upper Miss." 1842.

"Geology of the Valley of the Mississippi." *Am. J. Sc.*, 1844.

"Geographical Survey of State of Missouri." *Western J. & Civilian*, St. Louis, 3: 1850. "Some remarks on the Geology of State of Mo." 1851. Report on Missouri copper mines, 1853.

Candidate in 1853 for state geologist of Missouri.

A geological member of A. A. A. S. 1848–54.

No biographic sketch of him found. A St. Louis roster of 1860, gives his address then as Washington.

36. Rufus Haymond, M.D., 1805–86, *b.* West Virginia. *P.* of Brookville, Ind. Naturalist; geologist; legislator.

Wrote on Silurian fossils in *Am. J. Sci.*, 1844, p. 294.

"He had charge of the geological survey of Franklin County (Ind.) in 1869."

A paper on "Birds of Southeastern Indiana" in 1856.

(Kemper's "Med. History of State of Indiana," 1911, p. 127.)

37. Lunsford Pitts Yandell, M.D., 1805–78, *b.* Tenn. *P.* With Dr. B. F. Shumard, wrote "Contributions to the Geology of Ky." Louisville, 1847, p. 36.

"He made many valuable contributions to paleontology."

Various fossils named for him.

He was also Professor of Chemistry, a clergyman, editor, President of Med. College, etc. (I, XIII.)

38. Chas. Thomas Jackson, M.D., 1805–80, *b.* Mass. *P.* State geologist of Maine (report I in 1837), Rhode Island and New Hampshire. On Michigan (1847) and United States western surveys. Famous in relation to anesthesia. (I, II, 1924, July, p. 5.)

39. David Dale Owen, M.D., 1807–60, *b.* Scotland. Studied medicine to learn anatomy and physiology for use in geology and paleontology; geologist of Tennessee, Indiana, Kentucky, Arkansas and on western United States surveys. His collection sold for $20,000.

(V, VI.)

40. Thomas Ryland Brown, A.M., M.D., 1807–90, *b.* Ky., *P.* at Crawfordville, Ind. "Did field work in geology"; collected crinoids. State geologist of Indiana in 1854, and made one report. Located glacial drift, coal and pottery clay.

In 1858 Professor of Natural Sciences at Butler University. Also Professor of Chemistry in various medical schools. "In 1871 appointed by President Garfield chief chemist of the United States." (Later succeeded by his pupil, Harvey Wiley.)

At times a Campbellite preacher.

(V. *Indiana Mag. History*, 1927, 92–106. Also Kemper's "Med. History of Ind.")

41. John Leonard Riddell, A.M., M.D., 1807–65, *b.* Mass. (General sketch of the geology of Ohio, 1837, as part of a committee report.)

On the scientific exploration of Texas, 1838. "Observations of the Geology of Trinity Country, Texas" in *Am. J. Sci.*, 1839.

"The constitution of Matter," N. O., 1846, pp. 32. Professor of Botany and Chemistry. Numismatist. United States refiner at New Orleans. Invented the binocular microscope.

(I, XII, XIII, V. Obituary in *N. O. M. & S. J.* 1866–67, XIX.)

42. Louis (J. L. R.) Agassiz, M.D., PH.D., 1807–73, *b.* Switzerland. Explored the Lake Superior region in 1848 (1850); a founder of the Glacial-Age theory; author of "Geological Studies," Professor of Geology, etc., at Harvard. (IV, XV.)

43. Joseph Granville Norwood, M.D., 1807–96, *b.* Ky., *P.* On northwestern survey. State geologist Illinois (1858) and Missouri. Also on state surveys of Iowa, Wisconsin, Minnesota, and Nebraska. Professor of Natural History at University of Missouri.

(I, V.)

44. Douglas Houghton, M.D., 1809–

45, *b.* New York, *P.* Explorer on Schoolcraft's and other expeditions; state geologist of Michigan; Professor of Geology, etc., University of Michigan. Drowned on an exploring trip.

(I, VIII.)

45. Robert Wilson Gibbes, M.D., 1809–66, *b.* S. C., *P.* Associate Professor of Geology at South Carolina College. Wrote "The present Earth, the Remains of a former World," 1849. Collector of fossils and minerals. Ornithologist. Mayor. Surgeon General S. C.

(I. IV.)

46. Oliver Payson Hubbard, M.D., LL.D., 1809–1900, *b.* Conn. "The Mineralogy and Geology of the White Mts. of N. Hampshire," 1837. "An aerial Erosion," 1850. "Impressions in Slate," 1843. Professor of Geology, etc., at Dartmouth. President of A. A. A. S.

(I, V. Has 9 entries in XIX.)

47. Hiram A. Prout, M.D., *b.* after (?) 1810, *d.* 1862. "A fossil maxillary Bone of a Paleotherium," XVIII, 1847, the first description of a Bad Lands fossil, sent him by a friend.

"On the economical Geology of the State of Mo.," in *West. J. & Civilian*, 1848.

On the first Illinois geologic survey, 1851. "Polyzoa from the Paleozoic" in volume II.

"The Advantages of a geological Survey of the State of Mo.," 1851.

"A new Graptolite found in the lower Silurian." XVIII, 1851.

"Carboniferous Limestone of St. Louis," 1856.

"Bryozoa from the Paleozoic Rocks," 1858.

In 1860 President of St. Louis Academy of Science.

Collector of fossils. A founder and Professor of St. Louis Medical College (1841–2), but soon retired.

(XVI and XVIII for 1862, p. 453, mere notices of death. No sketch of him found. Bibliography in XIX.)

48. Richard Owen, M.D., LL.D., 1810–90, *b.* Scotland. Geologist of Minnesota, New Mexico, Arizona, North Carolina and Tennessee; Professor of Geology, etc., at Indiana University and University of Tennessee; wrote "Key to Geology of the Globe," (1857). (V, VI.)

49. Frederick Adolphins Wislizenus, M.D., 1810–89, *b.* Germ. *P.* in St. Louis. On Doniphan's expedition to northern Mexico, 1846 and 1847. Explored also in Texas. Made a brief geological report on New Mexico. Collector.

(I, VIII. Also *Pop. Sci. Mo.*, 52: 1898.)

50. James Hall, M.D., LL.D., 1811–98, *b.* Mass. State geologist of New York, Iowa and Wisconsin, paleontologist; explorer; director of New York State Museum; President A. A. A. S.; and International Congress of Geologists; medallist. (V, VI.)

51. John Farnham Boynton, M.D., 1811–90, *b.* Mass., *P.* Geologist; mineralogist; inventor.

Public lecturer on such subjects as "Geology and the Natural History of Creation." "Travelled through every state in the Union, lecturing . . . He prospected along the south shore of Lake Superior." (IV, IX.)

52. John Evans, M.D., 1812–61, *P.*, *b.* New Hampshire. United States geologist of Oregon and Washington, and in Central America.

Discoverer of the Bad-Lands fossils; railroad builder, Evanston named for him.

(VI. Obituary by B. F. Shumard in *Trans. St. Louis Acad. Science*, 1863.)

53. Caleb Briggs, Jr., M.D., 1812–80, *b.* Mass., *P.* Local geologist of Ohio

and Virginia state survey; founded library at Ironton, Ohio. (V.)

54. James Schiel, M.D., Oct. 31, 1813–18—, *b.* Stromberg, Kreis Kreuznach, Germany. As surgeon and geologist of Lieut. Gunnison's 1853 party, he wrote:

"Geological Report of the country explored" under the 38 & 41 parallels of north latitude in 1853–54, in Vol. II, p. 97–107 of "Exploration and Survey for R. R. from Miss. River to the Pacific," 1853–55, D.C. 1860.

"Reise durch die Felsengebirge & die Humboldt Gebirge nach dem stillen Ocean." Schaffhausen, 1850. This is a description of his 1853–54 trip with Capt. Gunnison's corps in the Pacific R. R. Survey, including geologic notes and a chapter on the Mormons. (A copy in the New York Public Library.)

"On the presence of phosphoric acid in igneous rocks." XVIII, second series, Vol. 31, May 1861, p. 353.

He became Docent at the University of Heidelberg in 1845, came to America in 1849, returned to Heidelberg in 1859, and later moved to Baden-Baden. He is said to have been alive in 1883, and perhaps in 1898.

Bibliography in *U. S. Nat. Hist. Bull.*, 1885, 253.

(Some of this data is kindly furnished by Prof. G. Binz, head librarian at the University of Basel.)

55. Jeffries Wyman, A.M., M.D., 1814–74, *b.* Mass. Professor of American Archaeology and Ethnology at Harvard; collector, comparative anatomist, paleontologist, curator, President A. A. A. S. (IV, XV.)

56. Abraham Litton, M.D., 1814–91, *b.* Ireland. Was two years with D. D. Owen on geological survey of upper Mississippi region. "Inspected lead mines of S.E. Mo., and contributed a chapter on the subject to Part II, Second Annual Report of Geology of Missouri," 1853. Collector of minerals. Professor of Chemistry, St. Louis Medical College. (I, IV.)

57. Silas Hamilton Douglas, M.D., 1816–90, *b.* New York, *P.* On Michigan geological tours; Professor of Geology, etc., University of Michigan. Collector. (I, IV.)

58. Benjamin Silliman, Jr., M.D., LL.D., 1816–85, *b.* Conn. In 1844 made a report "On the Intrinsic Trap of the New Red Sandstone in Conn." Made mineralogic and geologic explorations in California and Virginia. In charge of those Departments at New York World's Fair in 1853. Researches on meteorites. Collector of minerals (in Cornell and Yale Museums). Professor of Chemistry at Yale. Editor of scientific journals. Secretary American Geologic Society.

(I, IV, V, XIII. And Yale Alumni.)

59. Richard O. Currey, A.M., M.D., 1816–65, *b.* Tenn. Trained by Troost (*Supra*, ¶8). Professor of Chemistry and Geology at East Tennessee University. Wrote "Geology of Tenn." with map, and "Medical Topography of Nashville and Vicinity" in *Southern J. Med. & Physical Sciences*, 1854. Co-editor of that Journal. Professor of Chemistry and an organizer of Shelby Medical College. In 1859 ordained as Presbyterian clergyman. Died from war exposures.

(Brief sketch in *Trans. Tenn. Medical Society* for 1876, p. 80. Bibliography in XIX.)

60. Thomas Antisell, M.D., PH.D., 1817–93, *b.* Ireland. *P.* Wrote a volume on "Irish Geology" in 1846. "Geologist of the Expedition," United States Survey for Pacific Railroad. VII, 1857, Washington.

Professor of Chemistry at Georgetown and other colleges.

(I. Hist. Med. Soc. of D.C., 1909, 244–5.)

61. John Lawrence Smith, M.D., 1818–83, *b.* South Carolina, *P.* Professor of Chemistry at Universities of Virginia and Louisville. Wrote, "Chemistry of American Minerals."

President A. A. A. S., collector of meteorites (sold for $8000., went to Harvard), medalist. (XIII.)

62. Benj. Franklin Shumard, M.D., 1820–69, *b.* Pa. *P.* Geologist and paleontologist, with Dr. John Evans in 1850, on United States geologic survey of North Western Territory. Geologist of Missouri, Texas and Kentucky. On Marcy's 1852 Red River expedition.

President St. Louis Academy of Science. Professor of Obstetrics.

(IV, V. *Western J. Med.*, 1869, IV, with bibliography.)

63. Carl Ludwig Rominger, M.D., 1820–1907, *b.* Germany, *P.* State geologist of Michigan (1870–83), paleontologist in Ohio; medalist.

(III for 1906–7. Sketch and picture in V.)

64. John Strong Newberry, M.D., LL.D., 1822–92, P. *b.* Conn. State geologist of Ohio; explorer; paleontologist of United States geological survey; Professor of Geology at Columbia. (XI.)

65. James Merrill Safford, M.D., PH.D., 1822–1903, *b.* Ohio. State geologist of Tennessee; Professor of Geology Vanderbilt (then Cumberland) University; chemist. (VI. Has 47 entries in XIX.)

66. Charles Christopher Parry, A.B., M.D., 1823–90, *b.* England, *P.* "On D. D. Owen's geological survey of the northwest." Geologist to Major Emery's Texas Boundary expedition. Wrote "Geological Features of the Rio Grande Valley," 1857, and other parts of the report. Explorer; geologist; collector; chiefly botanist.

(I, V, XII.)

67. Joseph Le Conte, M.D., LL.D., 1823–1901, *b.* Georgia. Professor of Geology at University of California. Wrote "Elements of Geology," and many articles. (I, IX.)

68. Joseph Leidy, M.D., LL.D., 1823–91, *b.* Phila., *P.* "Founder of vertebrate paleontology in America," Wrote "Extinct Mammalian Fauna of Nebraska and Dakota," 1869. Professor of anatomy at University of Pennsylvania, and of Natural History at Swarthmore College.

(IV. "The Joseph Leidy Commemorative Meeting," 1923, Philadelphia.)

69. John Boardman Trask, M.D., 1824–July 3, 1879, *b.* Roxbury, Mass., *P*, State geologist of Nevada and California (making California reports of 1854, 1855 and 1856). Wrote on earthquakes, ammonites (in *Proc. Cal. Academy*, Vol. I), and "Geology of the Coast Mountains," 1855.

(V. Also, "Remarks on the late Dr. J. B. Trask, before the Cal. Academy of Science, July 21, 1879," by Albert Kellogg, M.D.)

70. John Lawrence Le Conte, A.B., M.D., 1825–83, *b.* New York, *P.* Entomologist. Geologist. Topographic engineer. Explorer in the West and abroad. His writings include:

"Volcanic Springs in Southern California," 1855.

"Geology of Survey for U. P. R. R to the Rio Grande," 1858.

"Formation of Oceans and Continents," 1859.

"Cretaceous Coal in New Mexico," 1868.

President of A. A. A. S. in 1875.

(I, XIII.)

71. George Goetz Shumard, M.D., 1825–67, *b.* New Jersey, *P.* Geologist

to Marcy's Red River (1852), and Pope's (1856) expeditions; state geologist of Texas; paleontologist. (V.)

72. Charles Abiathar White, M.D., LL.D., 1826–1912, *P.*, *b.* Mass. State geologist of Iowa, geologist and paleontologist on United States surveys and in Brazil; explored the Rockies.

Professor of natural history at University of Iowa and at Bowdoin; curator of United States National Museum. (I, III for 1910–11, V.)

73. Rev. James Woodrow, M.D., PH.D., LL.D., 1828–1907, *b.* England. Professor of geology and President of South Carolina College.

Wrote, "Geology and its Assailants," 1863, Religious editor.

(III for 1906–07. And IV.)

74. Charles Lewis Anderson, M.D., 1828–1910, *P.* In 1852 he went to Minnesota, and became known as "geologist, entomologist and florist." A secretary in 1853 of that State Medical Society. As one of two State Commissioners on Geology he, in 1861, reported on "General Geological Features of Minnesota," and "On a plan for a geological Survey" of same.

Later he went West. Published in 1870 a Flora of Nevada. From 1870 in California, various papers on willows, the last in 1890. "An authority on marine botany." For many years a school trustee of Santa Cruz, Cal. Died there of "senile debility," Dec. 22, 1910, aet. eighty-two years.

(*J.A.M.A.*, I; 363, 1911, *Journal-Lancet*, March, 1918, p. 129, Bradley Bibliography (botanic), 1918. Also a Bibliography of Minn. geology.)

75. Ferdinand Vandevere Hayden, M.D., LL.D., 1829–87, *b.* Mass. Explorer; head and great developer of United States Geological Survey of the Territories; Professor geology and Mineralogy University Pennsylvania. (I, VIII. and *Scientific American*, Jan. 7, 1888.)

76. James G. Cooper, M.D., 1830–1902, *b.* New York, *P.* "He collected in all branches" of natural science as surgeon on Pacific Railroad survey of 1853.

"In 1865 and 1866 he was naturalist to the geological survey of California" by its Mining Bureau.

With Dr. George Suckley he wrote, "The Natural History of Washington Territory," 1859.

"Cooper Ornithological Club of California was named in his honor."

(I. Also II, 1902, 268.)

77. Cornelius Ambrose Logan, M.D., LL.D., 1832–99, *b.* Mass. *P.* Geologist of Kansas; Wrote "On the Climatology of the Mo. Valley." Medical editor. United States Minister to Chile and Central America.

(I, XIII.)

78. Henry Adolphus Cutting, M.D., PH.D., 1832–92, *b.* Vermont, *P.* Long state geologist of Vermont, reports 1874–80. Wrote, "Mining in Vermont," 1872; curator; Professor of Natural Science, Norwich University; miscroscopist; founded Cutting Library.

("Gazeteer of Caledonia and Essex Counties," Vermont, 1887, Pt. I. Called Hiram in cyclopedias. Also IV.)

79. Lyman Beecher Sperry, A.M., M.D., 1841–1923, *b.* New York State, *P.* Professor of Geology in Carleton College, Minn. Explorer of Glacial National Park. Geologist of Rice Co., Minn. Survey of 1877.

(III for 1922–3.)

80. Charles Abbott, M.D., 1843–1919, *b.* New Jersey. Archeologist of Deleware River Valley; collector; naturalist; curator at University of Pennsylvania.

(III for 1918–19.)

81. Henry Martyn Bannister, A.M.,

M.D., 1844–1920, *b.* New York State, *P.* On Illinois, Alaska, United States western geological and Pacific Railroad surveys, later neurologist in Illinois.

(v. Also Semi-Centennial volume, American Neurological Association, 1924. And III for 1914–15.)

82. Henry Martyn Chance, C.E., M.D., 1856– , *b.* Pennsylvania. On state geological surveys of Pennsylvania and North Carolina. Now consulting geologist and coal engineer in Philadelphia.

(III for 1828–29 and XIV for 1927.)

83. Edward Oscar Ulrich, M.D., D.SC., 1857– *b.* Ohio, On state and United States geological surveys; coeditor "American Geologist"; curator; paleontologist.

(III for 1928–29, and XIV for 1927.)

Only the two following later instances of medically trained geologists appear in XIV. Ed. 4, 1927, viz.:

84. Ephraim Noble Lowe, PH.D., M.D., 1864– , *b.* Mississippi. Professor of geology at University of Mississippi, and director of State Geological Survey.

(III for 1928–29, and XIII for 1927.)

85. Joseph Culver Hartzell, M.D., PH.D., 1870– , *b.* Louisiana. Formerly Professor of Geology at Illinois Wesleyan and at Pacific Universities, now consulting chemist and metallurgist in Ohio.

(III for 1928–29, and XIII for 1927.)

The following eleven had partial medical training:

86. Stephen Elliott, LL.D., 1771–1830, *b.* South Carolina; Professor of Natural History at South Carolina Medical College, a Vice President of the first meeting of the American Geological Society (1819). Botanist; editor; President of bank and Philosophical Society. A founder of South Carolina Medical Society.

(XIII.)

87. Amos Eaton, A.M., 1776–1842, *b.* New York. Professor at Castleton Medical College, also lawyer and botanist; wrote "Index to Geology of the Northern States" (1819), and "Geological Text Book" (1830).

88. Dr. John Ruggles Cotting, A.B., 1784–1867, *b.* Mass. Listed under Cutting in Dartmouth Alumni.

Studied at Berkshire Medical College. Congregational clergyman in Georgia. Made in 1836 the first geological survey in Georgia; later he was its state geologist for two years. Wrote "Introduction to Chemistry," 1822; "Synopsis of lectures on Geology," Trenton, 1825; and on soils, etc. Collector.

(V, XVIII, 1867, p. 141–2. Also items from Miss Tye of Calhoun Medical Library, Georgia.)

89. Julius Timoleon Ducatel, 1796–1849, *b.* Md. Reared as a pharmacist; Professor of Chemistry, Geology and Mineralogy at Maryland and other colleges; state geologist of Maryland (1839–40) and made reports; also "A Geological Account" of coal and iron beds in Maryland. Was on the upper Mississippi River, and Superior survey in 1846. (XIII.)

90. William Williams Mather, LL.D., 1804–59, West Point 1828, *b.* Conn. Professor of Geology and Mineralogy (West Point and Wesleyan), state geologist (New York and Ohio and Kentucky); collector; wrote "Elements of Geology" 1833, and on geology and mineralogy of Conn. (V, VI.)

91. Samuel Botsford Buckley, PH.D., 1809–84, *b.* New York. State Geologist Texas; science editor; naturalist; founded Texas Science Ass. A mountain in North Carolina named for him. (VI.)

92. Rev. J. Peter Lesley, LL.D., 1819–

1903, *b.* Phila. State geologist Pennsylvania; President A. A. A. S.

Wrote "Manual of Coal" 1856.

(v. And III for 1901–2.)

93. Thomas Sterry Hunt, LL.D., 1826–92, *b.* Conn. On geological surveys of Pennsylvania, and on "Geologic commission of Canada." Professor of geology, Boston Institute of Technology; chemist; President A. A. A. S. (1871). (IV, VI.)

94. Wm. Phipps Blake, SC.D., LL.D., 1826–1910, *b.* N.Y. "On the Geology of the Route," II Pacific Railroad Surveys, D.C. 1856. Also vol. v, 1857, "Geological Report."

In 1862–64 Government geologist in Japan. Professor of Geology at University California. Geologist of Arizona. Director of Arizona School of Mines. Previously Professor of Chemistry at New York Medical College. Son of Dr. Elihu Blake, dentist. (II for 1910–11. IV, V.)

95. George Frederick Wright, D.D., LL.D., 1838–1921, *b.* N. Y. On United States Geological Survey.

Wrote "The Ice Age in North America"; and "Man and the Glacial Period." President of Ohio Archeological Club.

(III for 1920–21. Also his "Story of my Life and Work." 1916.)

96. William Healey Dall, D.SC., LL.D., 1845–1927. *b.* Mass. Paleontologist of the United States Geological Survey; Curator of United States National Museum; Professor of Invertebrate Paleontology at Wagner Free Institute of Science, Philadelphia; naturalist. Wrote "Medial Tertiary Fossils" (Ed. 2, 1893).

(III for 1926–27. And VI.)

Four prominent instances of the movement in Canada can be added.

97. John Jeremiah Bigsby, M.D., 1792–1881, *b.* England, son of Dr. John Bigsby; became an army surgeon in Canada 1818–27; reported on Canadian geology; secretary of Boundary Commission; wrote many papers "almost all treating of American geology," e.g.,

"Environs of Carthage Bridge near the Mouth of the Genessee River," XVIII, 1820.

"Geology & Geography of Lake Huron," *Trans. Geol. Soc.* of London.

"On the Geology of the paleozoic Basin or Area of Middle North America," 1850

Member of 1st American Geologic Society (1819), and of English Geological Society; Murchison medallist. Founded a gold medal for students of American geology.

(v. Also, English "Dict. of National Biography.")

98. Abraham Gesner, M.D., 1797–1864, *b.* Nova Scotia. *P.* Geologist of Nova Scotia (1836), New Brunswick (1838–43) and Prince Edward Island. Originator of kerosene. Oil man in Brooklyn, N. Y. Wrote in 1861 a work on coal and petroleum.

(I, V. Also XX, I. 225.)

99. Charles Robb, M.D., 1815–61, Professor of Natural Science, etc. in Canada. "He made a careful study of the geology and mineralogy of New Brunswick." His collection destroyed by fire.

(XIX gives him 9 articles and reports.)

100. Robert Bell, M.D., C.E., etc., 1841–1917, *b.* Toronto, well known chief of Canadian Geological Survey, explorer, multi-medallist. Professor of Chemistry (1863–67). (I, VIII.)

ACCESSORY WORKERS

Such a movement, besides its main and more active workers, draws many auxiliaries with some relation to geologic advance, though hardly sufficient for inclusion in the enumeration. A few on the medical side, as samples, are:

1′. Caspar Wistar, M.D., 1761–1818, *b.* Phila. Professor of Anatomy; described certain fossil bones in 1799. The Wistar Institute of Anatomy and Biology is named for him. (XII.)

2′. David Hosack, M.D., LL.D., 1769–1835, *b.* New York. Professor of Botany, and later Surgery. Made the first collection of minerals in America (given to Princeton). (XII, XIII.)

3′. Dr. James Greenway of Va., is credited with "An account of a Hill, near the borders of No. Carolina, supposed to have been a volcano," but later shown not to have been. In reality it was only a letter from one, T. D., "a continental officer," without further endorsement. *Trans. Am. Philosoph. Soc.*, 3: 231–3, 1793. (V.)

4′. John Rouell, M.D., of Va. "A Complete Treatise on the Mineral Waters of Virginia," Phila., 1792. (XI.)

5′. Dr. Albert (Carl) Koch, of Germany. In 1840–45 he explored in Missouri and Alabama for gigantic fossils (his criticised restitutions now in Washington). Wrote, "Reise durch einen Theil d. Vereingten Staaten von Nord America in den Jahren 1844–46," Dresden, 1847, pp. 162.

(Bibliography in XIX.)

6′. August H. Hanchett, M.D., nominally head of and wrote briefly for first Minnesota geologic report (N. Y., 1865); then dropped out of all records.

(V. Also, "Bibliography of Minn. Geology.")

7′. James Higgins, M.D., state chemist of Maryland. 1846–1858, with first six reports. Also wrote, "A succinct exposition of industrial resources and agricultural advantages of Maryland," 1867.

8′. Edward Hamilton Davis, M.D., 1811–88, *b.* Ohio, *P.* Archeologist. Mound explorer. Wrote, "Ancient Monuments of the Mississippi Valley," 1848, Vol. 1 of Smithsonian Contributions to Knowledge. Professor Materia Medica. (XIII.)

9′. John Fries Frazer, M.D., LL.D., 1812–72, *b.* Pa. On the first (1830) geological survey of Pennsylvania. Professor of Chemistry, etc. at the University of Pennsylvania. Editor, *Jour. of the Franklin Inst.*

10′. Rev. Orlando Williams Wight, A.M., M.D., 1824–88, *b.* N. Y., *P.* State geologist of Wisconsin in 1875. Chief of Milwaukee and Detroit Health Department. Was also an attorney. Wrote on history and art. Surgeon General of Wisconsin.

(XIII, XVI for 1888. "History of Long Island College Hosp. and Its Graduates, 1899.)

11′. John William Mallet, M.D., LL.D., 1832–1912, *b.* Ireland. Professor of Chemistry. Chemist of the 1853 Alabama Geological Survey.

(III for 1910–11.)

12′. Edward Hitchcock, Jr., M.D., LL.D., 1828–1911, *b.* Mass. Associated with his father in the geological survey of Vermont in 1856–61. (I.)

REVIEW

The list totals 100, or 96 for the United States, not counting the Accessories. All but four of the 100 were born by 1845, most of the major lights in fact over a century ago. All but four have now passed on.

As, according to Von Zittel (1899), "The third decade of the 19th century saw the beginning of active geological research in North America," it is clear that the medical side of the outfit played its chief part in the embryonic period of the science here, just another case of natal and prenatal care.

LIMITATIONS

A few eligibles may have been overlooked, largely amongst the lesser known, though good scientists are not always good advertisers. The total evidently ranged around 100, a convenient number for comparisons. There is little likelihood that missed names would materially modify the summings-up.

It may be objected that some of those admitted would not now be classed as technical or exclusive geologists. But there were no such persons until well after 1800. Nor does this point bear on the general correctness of the presentation. Their importance comes from the period at which they worked, the state of the science at that time, and their relation to its evolution here.

A few other geologists were occasionally referred to as "Doctor," but where investigation seems to show that they were not medical.

AN ESTIMATE OF THE MEDICAL SHARE IN THE PRIMARY DEVELOPMENT OF GEOLOGIC SCIENCE HERE

A ready basis for determining this is afforded by material in IV. That work carries, in the Conspectus of its Index volume (1906), a list of our geologists, arranged chronologically according to the time of beginning their active careers. Though some good names are lacking, it is an independent list and available for the present purpose.

In the first 20 names of that list (including all up to 1830) there are 10 that appear also in our medico-geologic list given here. But in the other ten names one (Benjamin K. Emerson) is inadvertently included, who was not born until much later, viz., in 1843, and that hence is to be excluded, leaving the ratio of 10 medicals in the first 19 names.

Good complementary evidence, in part earlier, is supplied by the list of chief attendants at the first American geologic meeting in 1819 at New Haven, as cited by Merrill (v, p. 62). He names 26; and in this number there were 15 physicians. The 10 and 15 respectively of the two lists overlap only to the extent of 4 names. As the two different methods of estimation give practically the same answer, or the earlier a trifle the higher, it can be considered conclusive.

In either of these test references (from IV and V) there are other names of individuals with medical ascendants or early association or training by medico-geologists, thus serving somewhat to reinforce the medical factor.

These facts permit the generalization that, *fully one half the personnel and initiative in the primary development of geologic science in America came from medical sources*, a convenient ratio for reference.

As there was no apparent "bloc" or controlling subgroup in either category, as those in each list were leaders or amongst the leaders of their time, and as the names were selected by purely geologic writers, this numerical method of estimate should be fairly correct and certainly free from promedical bias.

Any query, as to the most important early contributions to the subject here, can be left open. More relevant might be the question of who were the major introducers and leading teachers of the new discipline. Opinions are the only answers, and these may be tinged unless by specialists in that field. The conclusion given seems to accord sufficiently with the facts, and the estimated ratio of 50 per cent plus to be duly, if not unduly, conservative.

WHAT DID THESE MEN CONTRIBUTE TO GEOLOGY AND ITS ADVANCEMENT?

While there was soon an increasing share of others in the geologic personnel, the medicals were sufficiently numerous to make a large element not only in the early period but during much of the 19th century.

Some 44 of these were heads of state territorial and national geologic surveys or expeditions, and 23 more were thus associated, proof that they were something more than boomers and mental vagrants.

Enthusiastic teachers of a subject are almost as important as are original workers. And at least 54 of these were professors of geology or allied subjects in colleges, often as part of courses in natural science.

That 26 were honored with an LL.D., and several with PH.D., further attests their merits. And 7 were presidents of the A. A. A. S., favored doubtless by the fact that geologists were the originals in that organization. Notable collections of illustrative material were made by 25 or more.

The activities and successes of these men as geologic explorers, writers and teachers, contributed largely to the development of the subject in this country. Their record in the inception of the specialty here constitutes a brilliant side-chapter in American medical history, and deserves due recognition.

WHY DID THESE MEN TAKE UP GEOLOGY?

The reasons herefor were in part individual, in part general. Limited choice of callings, slow growth of practice, medical drudgery, local incentives, hobbies, sheer restlessness and the like appear to have been casual factors, rather than basic causes for a switch in life-work.

With some it was not a change but an added activity. The chance of finding valuable minerals, new plants or other novelties gave a zest to the work with many. Personal health needs in certain instances doubtless dictated the move. Several from abroad were already in touch with the subject. While the few clericals may well have been actuated by possible relation of the new line to theologic thought. Such separate reactions are of less concern than is the general etiology of the movement.

The greatest abundance of medical graduates in our history was towards the close of the 19th century, after the medico-geologic episode, and hence offers no solution. The search for curative agents could not have actuated them, unless possibly on the mineralogic side. In the case of geology we must look further for reasons.

The scope, subdivisions and applications of later geology make it difficult to isolate its claims or attractions while in the embryonic stage. Yet even Virchow somewhat later showed a keen interest in such phases as anthropology and paleology. Some grounds herefor appear to have been:

A. It is thought that the beginning practitioner of other days was less subject to spirit-fag than is the long-trained modern, and was less self-satisfied with his qualifications. But youth ever seeks the new and exclusive. Geology was new, its path not over-trodden, and it promised new light on the problems of life. This included a not-altogether conscious impulse to escape the thralls of theocracy. In fact the geologic group, by their activities (as e.g. No. 72 *supra*), did much to prepare Americans for receiving evolutionary teachings.

B. Physicians at that time had the best if not the only preliminary training for this work (v. *infra*). Scientific schools were not under way until well into this period, and in their incipiency not much in vogue; Rensselaer from 1824, followed by others in 1847, 1848, 1852, 1853, etc.

C. At the initiation of this science, field work and observation were leading requisites. Exploring, collecting and adventure are natural tastes, and favorable to this development. Physicians were then largely scattered in suburban communities, the only culturalists much in the open, with opportunity to practice natural-history proclivities.

D. The peak of this wave was considerably raised in the middle portions of the last century by the impetus of allied circumstances, notably the exploration of our new western country. After the opening-up of the geologic and geographic fields the many national, territorial, state, local and Pacific railroad surveys, in the absence of trained regulars for such work, provided many openings for the ambitious. A living wage, however scanty, was assured. The physician came up for preference, as he could play a very useful double rôle.

On the government side voluminous reports were eventually published in vast tomes that in their green old-age covers now form the substantial and worthy nucleus of many a library storage vault.

Political pull may occasionally have had to do with appointment of state geologists. But often physicians, by developing the demand for such surveys, came up naturally for selection to the poorly paid jobs. A number of state surveys appear to have been "sold" to early legislators, under the guise of state and agricultural chemistry, accounting for a few instances in the list.

E. Close to the sentiment of immortality in the human is a natural desire to leave a hall-mark of personal contribution however modest, to our successors, as distinct from the mere animal lust for fame. Science, more than most lines, affords such opportunities in the building-up of its structure. Though the religionists may have developed this trait in us, it has become a subconscious force with all who strive. The new science of geology seemed full of possibilities, while medicine at that time was poor in such prospects.

F. Behind these stimuli we can see that in the main these men must have had a real taste and enthusiasm for the work. With botany, chemistry or biology it is easy to presume a direct professional interest. But, as this is not evident with geology and paleontology, the facts suggest that in *all* such branches an urge to the natural sciences played a larger rôle than any purely utilitarian interest.

An editorial on "Medical Men as Geologists,"* from Hippocrates down, says, "If there is any department of pure science in which we should expect physicians to take a minimum of interest, it is that of geology," a view that could not have prevailed universally in the medical mind of a century ago. And the occurrence of "The 13th International Congress of Hydrology, Climatology and Medical Geology" at Lisbon, in Oct. 1930 (*v.* V, vol. 2, Aug. 12, 1930) shows that there is still an affiliation of the two specialties at some points.

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* *N. Y. Med. J.*, 2: 805, 1912.

In any interpretation it is difficult to discount a tendency of the genus homo, notably the American variety, to run in flocks.

HOW FAR DID MEDICAL TRAINING AT THAT TIME PREPARE THEM FOR GEOLOGY?

It was not a question of how much, but of its availability for the new purpose. At that period physicians had more or less knowledge of animal structure,* systematic botany (not now often taught to medical students), all the chemistry and chemicals then known, and at times even the common minerals. They also had the invaluable habit of interpreting as well as observing phenomena. Then in explorations, expeditions and intensive surveys it was a great advantage to have a geologist who could also serve when needed as physician. However incomplete such an outfit was geologically, it was a big step in the right direction.

It is not evident that many of these studied medicine as an intentional introduction to the work; though after the initial stage a few, such as D. D. Owen, certainly did. It was simply the only starting point for anyone with tastes in that direction. Then as now medical work developed opportunism, in its best sense; after that it was a matter of chance and inclination.

Several were also of medical descent (15 at least), as are many now in the biologic sciences.

GEOGRAPHIC DISTRIBUTION BY BIRTH OR ACTIVITIES

This is hardly material, as such workers are more or less explorers, and travel far or near according to needs. They were mostly natives of the older and more settled parts of the country, a number from abroad, (Mass., 21., N. Y., 15, Conn., 9, Pa., 8, British Isles, 10, Ky., 3, S. C., 3, Va., N. J., N. H., Vt., Tenn., & Ohio each 2). Several had enjoyed continental advantages. Notable is the number from Germanic countries, 6, with important work to their credit. The cosmopolitan character of the group indicates that the movement here was part of a trend in all lands, the particular type of study in this early period of the science favoring migrations.

LENGTH OF LIFE

The average attained by the 94 with available dates was 69⅔ years, despite accidents, ranging from one at thirty-six to one at ninety-one, with 28, or about 30 per cent, over eighty. This suggests a practical form of long-life prescription; certainly multiple training and activities in the open need not abbreviate existence. This works favorably both ways, as an extended tenure of life is favorable to a slow observational development like geology.

MEDICAL STATUS OF THE BI-PROFESSIONALS

Naturally in the early period most of these men were practitioners for part or all of their careers. Later, when matters became more mature and strenuous, this was less the rule, a preliminary step on the road to dropping-out altogether.

Nearly all of them had an M.D. degree. In the earlier days it was often honorary, as that degree was not then generally available in course. In the few other honoraries it came justly from participation in medical work and teaching.

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* The old "Institutes of Medicine" (physiology) and more acquaintance with animal life gave also a working acquaintance with biotics.

A Trend of Physicians to Sciences and Other Lines

A slight tendency of medicals to change their objective or take on super-functions has not been limited to any one direction, though showing preferences. Whether it be termed change of calling, double training, alternating profession or otherwise designated, it is quite apart from the so-called "rolling stone" or the "hopper-grass mind." The number so affected has been considerable, though the ratio to the whole profession has been small, less apparently than in the law.

But little on this dispersion habit appears to have been collected, though a few references are possible:

The drive to geology did not begin as early as that to botany, an older science, and appears to have stopped sooner; while it lasted it may have been quite as popular. At least as much can be inferred by comparing Howard Kelly's most interesting book (xii) on some 38 of our early botanists (only those with a floral namesake), their birth-dates beginning with 1659, while our geo-medicals start with 1743.

Arthur Clarence Jacobson,* has recalled "Kearsley and Thornton; early American Physicians and Architects."

The writer has listed some 46 "Medical Explorers" (viii); 274 "Men of medical Training in Congress" (1789–1910),† and 48 "Physicians who have been Governors of our States, Territories and Colonies,"‡ such lists overlapping slightly. To these the present 112 to geology including the Accessories, can be added.

Figures for comparison with chemistry are not at hand, though biologic chemistry still shows instances. Paleontology, a kind of biologic geology, came later, and in this the medical element has hardly yet disappeared. In anthropology it is still active.

Astronomy, a mathematical science, does not seem to compete much here, though an occasional doctor's son veers that way.*

Viewed as mass production the small number of such devotees may have been due to various causes, the relatively small number of our astronomers in the past, and the limited bent of medical gentry for that type of work.

Scholarship in languages, history, etc., drew a select few.

Many have been drawn, part or all time, to journalism and literature. A larger contingent passed to business and its undertakings.

The outside calls appeal especially to the restless, energetic and ambitious. With the extra training as an added basis, they tally many successes in their later fields.

Other callings, as law and theology,

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* *Med. Times*, 51: 29–33, 1923.

† *Western Med. Times*, 39–47, 1919–20.

‡ *Ibid.*, 8–11, 1923.

* A few samples of this slight astronomical drift, all but one medical and all sons of physicians, are:

Dr. Nathaniel Ames, Jr., 1708–64, of Mass., astronomer and our first almanac maker. (xiii, 1898.)

Isaac Rand, Jr., M.D., 1743–1822, observer of transit of Venus. President of Mass. Med. Soc., (*ibid*).

Henry Draper, M.D., LL.D., 1837–82, early celestial photographer, discoverer of oxygen in the sun. (i, ix.)

William Harkness, M.D., LL.D., 1837–1903, Superintendent of the U. S. Naval Observatory. (ix.)

Prof. Edwin Brant Frost, D. SC., 1866– , *b.* Vt., Director of Yerkes Observatory at University of Chicago, editor of astronomic journals. (iii, ix.)

drew numerically more, but relatively less, each still showing proselytes.

There are 8 or more clergymen in this list. And medical missionaries are numerous. It is now possible to add 4 more to the 11 medical bishops noted in the Osler volume, making a total of 15, several of them missionaries.*

Many of the 100 medico-geologists passed through auxiliary lines, not then as well differentiated as now, mineralogists, chemists, anatomists, botanists, paleontologists, mining engineers, collectors, curators, explorers, all more or less affiliated at times with the work. A hobby very easily becomes a calling. There may be mongrel blood in any discipline; but many of these sciences would have been less viable without medical coddling. It is natural for physicians, in slang phrase, to help start something, and then let the kid toddle on by itself.

The custom of changing from one calling to another seems to be far more common in this country than in Europe. Whether with us it has been more frequent with medicals than with the citizenry in general is not certain. It did not originate with the geologic wave, as there were instances of it back in the Revolution. While this jumping habit has advantages at times, it may be expected to abate as conditions become more settled and communal organization progresses. New conditions, however, at any time, may give it a fresh boom.

The opposite tendency, recruiting medicine from other walks, hardly equalled the abstractions, unless in the case of medical missionaries. This reverse course was pursued by Bannister who was geologist first and physician later.

Now the increasing conditions for entering practice cut off more and more the slight pro-medical trend.

Summary by Birth—Decades

The course of the movement as a whole is well shown by the table below. While the totals are not large, if we add them up by birth-decades, it gives a very good epitome. There was a gradual even rise for fifty or more years, a peak or maximum at about 1805, a crest of forty years (1790–1830), and a sudden decline (v. *infra*) that however held on for some forty years.

The graph of their active periods would begin thirty or more years later, and (if deducible) take a somewhat similar course.

The epidemiologist might view this as a type curve for a slow outbreak due to some infection, or in this case to an intellectual *contagium vivum*.

Born in the years

1740–9 inclusive, there were 1
1750–9 inclusive, there were 2
1760–9 inclusive, there were 3
1770–9 inclusive, there were 7
1780–9 inclusive, there were 7
1790–9 inclusive, there were 15
1800–9 inclusive, there were 19
1810–9 inclusive, there were 16
1820–9 inclusive, there were 16
1830–9 inclusive, there were 4
1840–9 inclusive, there were 5
1850–9 inclusive, there were 2
1860–9 inclusive, there were 1
1870 inclusive, there were 1

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* Brandram Boileau Ussher, M.D., 1845–1925, *b.* Ireland. R. E. Bishop of Canada, later lived in the United States.

Chas. Spencer Smith, M.D., D.D., 1852–1923, *b.* Canada, Bishop of A. M. E. Church in South Africa.

Rev. Walter Russel Lambuth, M.D., 1854–1921, *b.* China, bishop of M. E. Church there.

Rev. John Albert Johnson, M.D., 1857–1928, *b.* Ont. Bishop of A. M. E. Church.

THE DECLINE

A drop in the medico-geologic recruits became evident well before 1850, and progressed gradually. If we take all the names from 1830 to 1850 in the same cyclopedia list used above (IV), it appears there were but 9 medicals and part-medicals in a total of 29 new workers. Hence in that period the medical ratio began very definitely to wane, by which time apparently the foundations of the new science had been outlined. From that time on the ratio continued to ebb, so that for many years now there have been no new medical accessions. The movement can therefore be considered closed.

If, for control, the decline is viewed by birth-years, as shown by the preceding table, it is seen to have begun sharply about 1830. This striking drop was clearly due to the Civil War, as such men would not get settled at the new (i.e., geologic) line until thirty or more years of age. The drop would presumably have occurred without war, but more evenly. War experiences did not stimulate any tendency to lithologic study, and at its close potential votaries sought lines more promptly remunerative.

The underlying etiology of this involution can be briefly considered. One main factor was doubtless the growth of facilities that permitted the acquisition of requisite training more advantageously than by swallowing the whole medical curriculum.

Less definite but of importance was the change in geologic vista. To the demands of theory, science, and teaching, came practical standards, (state needs, mining, oil, engineering, surveys, etc.). Here a different type of interest and knowledge ruled, to which medical acolytes were less responsive.

The possibility that when geologists became numerous and geology no longer a novel and select calling, it had less attraction, can be balanced up against the herd-tendency to follow a developed lead.

The lengthening of medical study came chiefly after this period, and hence was not apparently a primary factor in the decline. But it certainly served to emphasize tendencies. The details of medical technique, that the modern practitioner must keep up with, have acted strongly in the same sense. In the latter part of the 19th century, other branches came up, more closely connected with the healing art, and that sufficed to absorb any surplus talent or energy. The newer scope of medicine is all-absorbing, and there is no need to go far afield for hobbies. In the future, as in the past, any such trend will go chiefly to the latest and most closely affiliated offshoots or collaterals.

The opposite is now observed. From very diverse medical centers and leaders comes word that all are on the sharp lookout for capable oncomers. Moreover it is now only in limited geologic phases that medical training has much to offer, and these can be better supplied by special courses.

With the firm establishment of geology as a specialty, and a supply of directly trained workers, the physician simply dropped out. The combination was important to the nascent period of American geology, but any recurrence of the trend can hardly be imagined. It will not be needed, there will be no one to heed such a call, and it will be both technically and economically impracticable.

When earth lore has adequately advanced, there may be a chance for return of professional favors. Geologists may be able, in the not-too-far future, to reciprocate by rejuvenating and extending our forgotten spas, by developing a geopathic cult, by at least making merry with the foibles, fancies, and follies that are forever foisted on the physician, or by other aids that time and their variant skill disclose.

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PHINEAS FLETCHER AND FRANCIS QUARLES AND THE PURPLE ISLAND OF PHINEAS FLETCHER*

By SAMUEL W. LAMBERT, M. D.

NEW YORK

MY first attraction to "The Purple Island" of Phineas Fletcher was to its portrayal of the anatomy and physiology of the body in the verse of the early seventeenth century. Another, and perhaps the determining, inducement to purchase a book of which I knew nothing was the fact that "The Purple Island" was bound up with some piscatory Eclogues, and other poetical miscellanies. A superficial reading of "The Purple Island" revealed at once that Fletcher knew more of anatomy than of physiology. The first edition was printed in 1633, five years after the (publication of Harvey's masterpiece "De Motu Cordis," and ninety years after the first edition of Vesalius' "Fabrica." The anatomy of Fletcher is, for a layman, a fairly accurate description of the Vesalian discoveries; the physiology, however, is that of Galen and knows nothing of the pulmonary circulation described by Michael Servetus in 1553 and by Matthaeus Realdus Columbus in 1557. Although Harvey had been lecturing at this time on his theory of the circulation of the blood for at least sixteen years, and had been in print for five years, it is probable that Fletcher had never heard of him or of his writings. If Fletcher had learned of the new theories of the circulation of the blood at any time during the five years between 1628 and 1633, it would seem that he had either suppressed his work or rewritten it.

The scheme of the poem, "The Purple Island," invokes various muses, and especially calls upon the muse of Giles Fletcher, the brother of the author.

Canto I

59.

My callow wing, that newly left the nest;
How can it make so high a towring flight?
O depth without a depth! in humble breast
With praises I admire so wondrous height.
  But thou, my sister Muse, mayst well go higher,
  And end thy flight; ne're may thy pineons tire:
Thereto may he his grace and gentle heat aspire.

Phineas Fletcher then pictures the creation of the world as in the Book of Genesis.

Canto I

39.

When that great Power, that All, farre more then all,
(When now his fore-set time was fully come)
Brought into act this undigested Ball,
Which in himself till then had onely room;
  He labour'd not, nor suffer'd pain, or ill;
  But bid each kinde their severall places fill;
He bid, and they obey'd; their action was his will.

40.

First stept the Light, and spread his chearfull rayes
Through all the Chaos; darknesse headlong fell,
Frighted with suddain beams, and new-born dayes;
And plung'd her ougly head in deepest hell:
  Not that he meant to help his feeble sight
  To frame the rest, he made the day of night:

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* Read at the Charaka Club April 15, 1931.

All els but darknesse; he the true, the onely
Light.

41.

Fire, Water, Earth, and Aire (that fiercely
strove)
His soveraigne hand in strong alliance ti'd,
Binding their deadly hate in constant love:
So that great Wisdome temper'd all their
pride,
(Commanding strife and love should never
cease)
That by their peacefull fight, and fighting
peace,
The world might die to live, and lessen to
increase.

and thus the creation of man:

43.

Now when the first weeks life was almost spent,
And this world built, and richly furnished;
To store heav'ns courts, and steer earths
regiment,
He cast to frame an Isle, the heart and head
Of all his works, compos'd with curious art;
Which like an Index briefly should impart
The summe of all; the whole, yet of the whole
a part.

45.

Then plac't it in the calm pacifick seas,
And bid nor waves, nor troublous windes
offend it;
Then peopled it with subjects apt to please
So wise a Prince, made able to defend it
Against all outward force, or inward spite;
Him framing like himself, all shining bright;
A little living Sunne, Sonne of the living
Light.

46.

Nor made he this like other Isles; but gave it
Vigour, sense, reason, and a perfect motion,
To move it self whither it self would have it,
And know what falls within the verge of
notion:
No time might change it, but as ages went,
So still return'd; still spending, never
spent;
More rising in their fall, more rich in detriment.

48.

Look as a scholar, who doth closely gather
Many large volumes in a narrow place;
So that great Wisdome all this All together
Confin'd into this Islands little space;
And being one, soon into two he fram'd it;
And now made two, to one again reclaim'd
it;
The little *Isle of Man*, or *Purple Island*
nam'd it.

Fletcher pictures the anatomical structure of the body: an island with power of motion nourished by the purple rivers known as veins and arteries; the chief cities are described in terms of the anatomy of the Head, Heart and Liver. The circulation of the blood is pictured as an ebb and flow in the vessels from the liver and heart to the distant parts of the body and then back again in the same channels. This flow could never empty the vessels and presents no conception of the vascular circle of Harvey. The details of this movement of the blood is peculiarly the physiology of Galen. It seems worth while to quote at some length the verses of Fletcher. The poem is printed within a ruled frame with margin in which prose notes explain the anatomical terms and the allusions to the physiology and the psychology of the humours of the body; both notes and verses are quoted:

Canto IIII

4.

(Note a) The heart is the seat of heat, and life; therefore walled about with the ribs, for more safety.

This middle coast to all the Isle dispends
All heat and life: hence it another Guard
(Beside those common to the first)
defends;
Built whole of massie stone, cold, drie, and
hard:
Which stretching round about his circling
arms,
Warrants these parts from all exteriour
harms;
Repelling angry force, securing all alar'ms.

5.

(Note b) The breasts, or paps, are given to men for strength, and ornament; to women, for milk and nurserie also.

But in the front two fair twin-bulwarks rise,
In th' Arren built for strength, and ornament;
In Thelu of more use, and larger size;
For hence the young Isle draws his nourishment;
Here lurking Cupid hides his bended bow;
Here milkie springs in sugred rivers flow;
Which first gave th' infant Isle to be, and then to grow.

6.

(Note c) When the infant grows big he so oppresseth the vessels of blood, that partly through the readinesse of the passage, but especially by the providence of God, the bloud turns back to the breast, & there by an innate but wonderful facultie is turned into milk.

For when the lesser Island (still increasing
In Venus temple) to some greatnesse swells,
Now larger rooms and bigger spaces seizing,
It stops the Hepar rivers; backward reels
The stream, and to these hills bears up his flight,
And in these founts (by some strange hidden might)
Dies his fair rosie waves into a lily white.

7.

So where fair Medway, down the Kentish dales
To many towns her plenteous waters dealing,
Lading her banks, into wide Thamis falls;
The big-grown main with fomie billows swelling,
Stops there the sudding stream; her steddy race
Staggers awhile, at length flies back apace,
And to the parent fount returns its fearfull pace.

8.

(Note d) The breasts are in figure hemisphericall; whose tops are crowned with the teats, about which are reddish circles, called (Areolae, or) little altars.

These two fair mounts are like two hemispheres,
Endow'd with goodly gifts and qualities;
Whose top two little purple hillocks reares,
Most like the Poles in heavens Axletrees:
And round about two circling altars gire,
In blushing red; the rest in snowy tire
Like Thracian Haemus looks, which ne're feels Phoebus fire.

9.

That mighty hand in these dissected wreathes,
(Where moves our Sunne) his thrones fair picture gives;
The pattern breathlesse, but the picture breathes;
His highest heav'n is dead, our low heav'n lives:
Nor scorns that loftie one thus low to dwell;
Here his best starres he sets, and glorious cell;
And fills with saintly spirits, so turns to heav'n from hell.

10.

(Note e) In the Thorax or breast, are sixty-five muscles for respiration, or breathing, which is either free or forced; the instruments of forced breathing are sixtie foure, whereof thirtie two distend, and as many contract it.

About this Region round in compasse stands
A Guard, both for defence, and respiration,
Of sixtie-foure, parted in severall bands;
Half to let out the smokie exhalation,
The other half to draw in fresher windes:
Beside both these, a third of both their kindes,
That lets both out, & in; which no enforcement bindes.

11.

(Note f) The instrument of the free breathing is the Diazome or Diaphragma, which we call the midriffe, as a wall parting the heart and liver: Plato affirms it a partition between the seats of desire, and anger: Aristotle, a barre to keep the noisome odour of the stomack from the heart.

(Note g) The midriffe dilates itself when it draws in, contracts itself when it puffes out the aire.

This third the merrie Diazome we call,

A border-citie these two coasts removing;
Which like a balk, with his crosse-builded wall,
Disparts the terms of anger, and of loving;
Keeps from th' Heart-citie fuming kitchin fires,
And to his neighbours gentle windes inspires;
Loose when he sucks in aire, contract when he expires.

12.

(Note h) The midriffe consists of two circles, one skinny, the other fleshie. It hath two tunicles, as many veins and arteries, and foure nerves.

The Diazome of severall matter's fram'd:
The first moist, soft; harder the next, and drier:
His fashion like the fish a Raia nam'd;
Fenc'd with two walls, one low, the other higher;
By eight streams water'd; two from Hepar low,
And from th' Heart-town as many higher go;
But two twice told down from the Cephal mountain flow.

13.

(Note i) Here most men have placed the seat of laughter; It hath much sympathie with the brain, so that if the midriffe be inflamed, present madnes causes it.

Here sportfull Laughter dwells, here ever sitting,
Defies all lumpish griefs, and wrinkled care;
And twentie merrie-mates mirth causes fitting,
And smiles, which laughters sonnes, yet infants are.
But if this town be fir'd with burnings nigh,
With selfsame flames high Cephale towers fry;
Such is their feeling love, and loving sympathie.

14.

(Note k) Within, the Pleura (or skinne which clotheth the ribs on the inside) compasses this middle region.

(Note l) The chiefest part of this middle region is the Heart, placed in the midst of this province, and of the whole bodie: fitly was it placed in the midst of all, as being of all the most needfull.

This coast stands girt with a peculiar wall,
The whole precinct, and every part defending:
The chiefest Citie, and Imperiall,
Is fair Kerdia, farre his bounds extending;
Which full to know were knowledge infinite:
How then should my rude pen this wonder write,
Which thou, who onely mad'st it, onely know'st aright?

15.

In middle of this middle Regiment
Kerdia seated lies, the centre deem'd
Of this whole Isle, and of this government:
If not the chiefest this, yet needfull'st seem'd,
Therefore obtain'd an equall distant seat,
More fitly hence to shed his life and heat,
And with his yellow streams the fruitfull Island wet.

16.

(Note m) The Heart is immured partly by a membrane going round about it, (and thence receiving his name) and a peculiar tunicle; partly with a humour like whey or urine, as well to cool the heart, as to lighten the body.

Flankt with two severall walls (for more defence)
Betwist them ever flows a wheyish moat;
In whose soft waves, and circling profluence
This Citie, like an Isle, might safely float:
In motion still (a motion fixt, not roving)
Most like to heav'n in his most constant moving:
Hence most here plant the seat of sure and active loving.

17.

(Note n) The flesh of the heart is proper and peculiar to itself, not like other muscles; of a figure pyramicall. The point of the heart is (as with a diademe) girt with two arteries, and a vein, called the crowns.

Built of a substance like smooth porphyrie;
His matter hid, and (like it self) unknown:
Two rivers of his own; another by,

That from the Hepar rises, like a crown,
Infold the narrow part: for that great All
This his works glory made pyramicall;
Then crown'd with triple wreath, & cloath'd in scarlet pall.

18.

(Note o) Though the heart be an entire body, yet it is severed into two partitions, the right, and left, of which the left is more excellent and noble.

(Note p) The right receives into his hollownesse the bloud flowing from the liver, and concocts it.

The Cities self in two partitions reft;
That on the right, this on the other side:
The right (made tributarie to the left)
Brings in his pension at his certain tide,
A pension of liquors strangely wrought;
Which first by Hepars streams are hither brought,
And here distill'd with art, beyond or words or thought.

19.

(Note g) This right side sends down to the lungs that part of this bloud which is lease laboured, and thicker; but the thinner part it sweats through a fleshie partition into the left side.

(Note r) This fleshie partition severs the right side from the left; at first it seems thick but if it be well viewed, we shall see it full of many pores, or passages.

The grosser waves of these life-streams (which here
With much, yet much lesse labour is prepar'd)
A doubtful chanel doth to Pneumon bear:
But to the left those labour'd extracts shar'd,
As through a wall, with hidden passage slide;
Where many secret gates (gates hardly spi'd)
With safe convoy give passage to the other side.

20.

(Note s) Two skinny additions (from their likenesse called the ears) receive, the one the thicker bloud, (that called the right) the other, (called the left) takes in the aire sent by the lungs.

At each hand of the left two streets stand by,
Of several stuffe, and severall working fram'd,
With hundred crooks, and deep-wrought cavitie:
Both like the eares in form, and so are nam'd.
I' th' right hand street the tribute liquor sitteth:
The left forc't aire into his concave getteth;
Which subtile wrought, & thinne, for future workmen fitteth.

21.

(Note t) The left side of the heart takes in this aire, and bloud; and concocting them both in his hollow bosome, sends them out by the great arterie into the whole body.

The Cities left side, (by some hid direction)
Of this thinne aire, and of that right sides rent,
(Compound together) makes a strange confection;
And in one vessel both together maynt,
Stills them with equal never-quenched firing:
Then in small streams (through all the Island wiring)
Sends it to every part, both heat and life inspiring.

22.

(Note u) In the heart are foure great vessels: the first is the hollow vein bringing in the bloud from the liver; at whose mouth stand three little folding doores, with three forks giving passage, but no return to the blood.

In this Heart-citie foure main streams appeare;
One from the Hepar, where the tribute landeth,
Largely poures out his purple river here;
At whose wide mouth a band of Tritons standeth,
(Three Tritons stand) who with their three-forkt mace
Drive on, and speed the rivers flowing race,
But strongly stop the wave, if once it back repace.

23.

(Note*) The second vessel is called the arterie-vein, which rising from the right side of the heart, carries down the bloud here prepared to the lungs for their nourishment. Here also is the like three-folding doore, made like half-circles; giving passage from the heart, but not backward.

(Note x) The third is called the Veiny arterie, rising from the left side, which hath two folds three-forked.

The second is that doubtfull chanel, lending
Some of this tribute to the Pneumon nigh;
Whose springs by carefull guards are watcht, that sending
From thence all waters, all regresse denie:
The third unlike to this, from Pneumon flowing,
And his due ayer-tribute here bestowing,
Is kept by gates and barres, which stop all backward going.

24.

(Note y) The fourth is the great arterie. This hath also a floud-gate made of three semi-circular membranes, to give out load to the vitall spirits, and stop their regresse.

The last full spring out of this left side rises,
Where three fair Nymphs, like Cynthia's self appearing,
Draw down the stream which all the Isle suffices;
But stop back-waies, some ill revolture fearing.
This river still it self to lesse dividing,
At length with thousand little brooks runnes sliding,
His fellow course along with Hepar chanels guiding.

25.

(Note z) The Heart is the fountain of life and heat to the whole bodie, and the seat of passions.

Within this Citie is the palace fram'd,
Where life, and lifes companion, heat, abideth;
And their attendants, passions untam'd:
(Oft very hell in this strait room resideth)
And did not neighbouring hills, cold aires inspiring,
Allay their rage and mutinous conspiring,
Heat all (it self and all) would burn with quenchlesse firing.

Following the description of the anatomy and physiology of the purple island, some notice is taken of its original and peaceful inhabitants: The five senses or "pemptarchie": Visus, sight; Auditus, hearing; Olfactus, smell; Gustus, taste; Tactus, touch. To these five Fletcher adds six counsellers, or pillars of the state: The Common Sense; Phantastes, the fancie or imagination; Eumnestis, the memory; and also the Chief ruler, the understanding; and the Queen, Voletta, the will; and Synteresis, the conscience are introduced.

Canto VI

42.

Those* five fair brethern which I sung of late,
For their just number call'd the Pemptarchie;
The other three, three pillars of the state:
The* first in midst of that higher Tower doth lie,
(The chiefest mansion of this glorious King)
The Judge and Arbiter of everything,
Which those five brethrens poasts in to his office bring.

* The common sense.

46.

The next that in the Castles front is plac't,
Phantastes hight; his yeares are fresh and green,
His visage old, his face too much defac't
With ashes pale, his eyes deep sunken been
With often thoughts, and never slackt intention:
Yet he the fount of speedy apprehension,
Father of wit, the well of arts, and quick invention.

48.

Phantastes from the first all shapes deriving,
In new abiliments can quickly dight;
Of all material and grosse parts depriving,
Fits them unto the noble Princes sight;
Which soon as he hath view'd with searching eye,
He straight commits them to his Treasurie,
Which old Eumnestes keeps, Father of memorie.

51.

But let my song passe from these worthy Sages
Unto this Islands highest* Soveraigne,
And those hard warres which all the yeare he wages:
For these three late a gentle shepherd-swain
Most sweetly sung, as he before had seen
In Alma's house: his memorie yet green
Lives in his well-tun'd songs, whose leaves immortall been.

*The understanding.

57.

Soon as the Prince these forms hath clearely seen,
Parting the false from true, the wrong from right,
He straight presents them to his beauteous Queen,
Whose Courts are lower, yet of equall might;
Voletta fair, who with him lives, and reignes;
Whom neither man, nor fiend, nor God constrains:
Oft good, oft ill, oft both; yet ever free remains.

61.

On her a royall damsell still attends,
And faithfull Counseller, Synteresis:
For though Voletta ever good intends,
Yet by fair ills she oft deceived is;
By ills so fairly drest with cunning slight,
That Vertues self they well may seem to sight,
But that bright Vertues self oft seems not half so bright.

62.

Therefore Synteresis of nimble sight,
Oft helps her doubtfull hand, and erring eye;
Els mought she ever stumbling in this night
Fall down as deep as deepest Tartarie:
Nay thence a sad-fair maid, Repentance, rears,
And in her arms her fainting Lady bears,
Washing her often stains with ever-falling tears.

Fletcher then portrays an attack upon the isle of man and sings an homeric battle between the native and peaceful dwellers of the purple island and the forces of evil led by the devil and all the sins to which man is heir. Among the enemy Fletcher marshalls the devil and five chief sins, and the fruits of the flesh.

Canto VII

13.

So now spread round about this little hold,
With armies infinite encamped lie
Th' enraged Dragon and his Serpents bold:
And knowing well his time grows short and nigh,
He swells with venom'd gore and poys'nous heat;
His tail unfolded heav'n it self doth beat,
And sweeps the mighty starres from their transcendent seat.

14.

With him goes Caro, cursed damme of sinne,
Foul filthie damme of fouler progenie;
Yet seems (skin-deep) most fair by witching gin
To weaker sight; but to a purged eye
Looks like (nay worse then) hells infernall hagges:
Her empty breasts hang like lank hollow hagges,
And Iris ulcer'd skin is patcht with leprous ragges.

15.

Therefore her loathsome shape in steel arayd,
All rust within, the outside polisht bright:
And on her shield a Mermaid sung and playd;
Whose humane beauties' lure the wandring sight,
But slimy scales hid in their waters lie:
She chants, she smiles, so draws the eare, the eye,
And whom she winnes, she kills: the word, Heare, gaze & die.

From Anagnus (unchastity) as sire and Asebie (irreligion) as dam are born Idololatrus (idolatry), Pharmacus (witchcraft), Haereticus (heresie) and Hypocrisie (hypocrisy). From Adicus (unrighteousness) as sire and Acrates (intemperance) as dam are begotten Ecthros (hatred) and Dichostasis (sedition), and there are added some dozen enemies more.

Later these worldly and evil antagonists are met in battle and overcome by the heaven sent virtues: Tapinus (humility); Fido (faith); Elpinus (hope); Pollicita, (promise); Androphilus (courtesy); Irenus (peaceableness); Macrothumus (long-suffering); Encrates (temperance); Andreos (fortitude); Agnia and Parthenia (chastity). The victory is won, and Fletcher refers to the Apocalypse of Revelations and to the poem of his brother Giles, "Christ's victory on ear and thtriumph in heaven" to portray the victory of religion.

The Fletcher family is well known in the English literary group of the early 17th century. There were two brothers, Richard (1530–1596) a clergyman and a bishop of London, and Giles (1529–1611) a politician who served in Parliament and in diplomatic posts. Of the next generation, John (1579–1625) the son of Richard, was the dramatist who shared in the work of Francis Beaumont. Phineas (1582–1660) and Giles, the younger, (1588–1623), sons of the elder Giles, both wrote pastoral verse, and both copied the style and methods of Edmund Spenser.

"The Purple Island" was probably written some time before 1628, for Fletcher in his dedication to Edward Benlowes says:

TO
MY MOST WORTHY
AND LEARNED FRIEND,
EDWARD BENLOWES
Esquire.

SIR,

As some Optick-glasses, if we look one way, increase the object; if the other, lessen the quantity; Such is an Eye that looks through Affection; It doubles any good, and extenuates what is amisse. Pardon me, Sir, for speaking plain truth; such is that eye whereby you have viewed these raw Essayes of my very unripe yeares, and almost childehood. How unseasonable are Blossomes in Autumne! (unlesse perhaps in this age, where are more flowers than fruit). I am entring upon my Winter, and yet these Blooms of my first Spring must now shew themselves to our ripe wits, which certainly will give them no other entertainment but derision.

Fletcher describes himself in 1633, at the age of fifty-one, as "entering on his Winter." In the poem he refers to King James the First as "our late sovereign," and so this "first Spring" must be between 1603 when he was twenty-one and 1625 when James I died. This poem, published in 1633, may be assumed as having been begun after 1603 and finished after 1625, and the author may be excused of ignorance of a recent though epoch-making discovery. Even in 1633 Harvey himself had no idea of the true physiology of the human body. Like Christopher Columbus who died believing he had found Japan, Harvey died probably without appreciating the revolution which his discovery of the circulation of the blood had started in the scientific knowledge of his time and portrayed in the purple island of Phineas Fletcher.

In 1633 Harvey had made no answer to his detractors and the numerous critics of his work on the circulation. The chief point of attack was the recognized fact that Harvey's discovery refuted many of the accepted theories and alleged facts of the physiology of the body. Only in 1649 did Harvey begin to exchange letters in support of his discovery with Johannes Riolanus, filius, of Paris, his most famous critic. Harvey in this controversy stands fixed on the proved circulation, his opponents, on the logical breaking down of the theory of the circulation because the acceptance of the circulation will forbid the prevalent explanation of the difference in the venous and the arterial bloods, and no reason for its existence could be shown from the accepted physiology of the day. Harvey's opponents exclaimed "Cui bono?" and Harvey could only retort, in 1649, "I have brought nothing forward as to this,—it remains to be shown."

Harvey died in 1657, aged seventy-nine, and could never know that his discovery was proved beyond all question by Lower's (1631–1691) studies of the anatomy of the heart; by Mayow's (1643–1679) demonstration of the absorption of an ingredient of the air (nitro-aerial spirit) by the blood while in the lungs; by Priestley's and Lavoisier's discovery in 1774 of the identity of this spirit with oxygen; by the microscopic view of the capillary circulation in the frog by Malpighi and Van Leeuwenhoek in 1661, and by von Helmholtz's demonstration in 1848 that the source of heat in the body was in the chemistry of muscular action and not from concoction of the blood in the heart.

It cannot therefore be justifiable to criticize Phineas Fletcher if with no medical training he portrays the physiology of man in the terms of Grecian medicine of Aristotle, 300 B. C., and of Galen, 200 A. D. It is no wonder then that Fletcher, a poet, in a book written before 1628, even though published in 1633, should show no interest in the work of Harvey, and present the physiological ideas of the "bodie of Man" which had prevailed for some fourteen centuries. It is perhaps even remarkable that he should have portrayed the anatomy of man with quite a good understanding of the new anatomy which had been developed during the previous nine decades that had elapsed since the publication of the book of Vesalius in 1543.

It was the custom of the writers of the 17th century to send their manuscripts to friends for their edification and sympathetic criticism. Each recipient of such writings would express his views in prose or verse, and return the same to the author. The author would then publish his literary venture with all the comments he had collected. The most endorsed volume among my books is "Coryates Crudities" which was published in 1611 and has 108 pages of commendatory contributions in a book of 654 pages. "The Purple Island" was no exception, and Phineas Fletcher prefaced the first edition with his epistle dedicatory to Edward Benlowes (already quoted), with complimentary notes and short poems from Daniel Featly, E. Benlowes and W. Benlowes, Lewis Roberts, Anthony Champny and Francis Quarles. This group of friends were all Royalists, and had a common hobby, angling, and most of them wrote pastoral and piscatory verse. Phineas Fletcher and Francis Quarles are known as intimates of Izaak Walton who mentions Fletcher by name in "The Compleat Angler," and who wrote a similar introduction for Quarles' "Shepherd's Oracles." It is especially to the laudatory verses of Francis Quarles published in "The Purple Island" that my own attention has been attracted.

Quarles' first poem is a sonnet in

which he congratulates the author upon pre-empting a subject which himself had already had in mind to attempt.

TO
THE INGENIOUS
COMPOSER OF THIS
PASTORALL, THE
Spencer [sic!*]of this age.

I vow (sweet stranger) if my lazie quill
Had not been disobedient to fulfill
My quick desires, this glory which is thine,
Had but the Muses pleased, had been mine.
My Genius jumpt with thine; the very same
Was our Foundation: in the very Frame
Thy Genius jumpt with mine; it got the start
In nothing, but Prioritie, and Art.
If (my ingenious Rivall) these dull times
Should want the present strength to prize thy rhymes,
The time-instructed children of the next
Shall fill thy margent, and admire the text;
Whose well read lines will teach them how to be
The happie knowers of themselves and thee.
—Fran. Quarles

Quarles' second poem is a detailed paraphrase of the anatomical portion of "The Purple Island":

Mans Bodie's like a house: his greater bones
Are the main timber; and the lesser ones
Are smaller splints: his ribs are laths, daub'd o're,
Plaister'd with flesh, and bloud: his mouth's the doore,
His throat's the narrow entrie, and his heart
Is the great chamber, full of curious art:
His midriffe is a large partition-wall
'Twixt the great chamber, and the spacious hall:
His stomack is the kitchin, where the meat
Is often but half sod, for want of heat:
His splene's a vessell nature does allot
To take the skumme that rises from the pot:
His lungs are like the bellows, that respire
In ev'ry office, quickning ev'ry fire:
His nose the chimney is, whereby are vented
Such fumes as with the bellows are augmented:
His bowels are the sink, whose part's to drain
All noisome filth, and keep the kitchin clean:
His eyes are crystall windows, cleare and bright:
Let in the object, and let out the sight.
And as the timber is or great, or small,
Or strong, or weak, 'tis apt to stand, or fall:
Yet is the likeliest building, sometimes known
To fall by obvious chances; overthrown
Ofttimes by tempests, by the full-mouth'd blasts
Of heav'n; sometimes by fire; sometimes it wastes
Through unadvis'd neglect: put case the stuffe
Were ruine-proofe, by nature strong enough
To conquer time, and age; put case it should
Ne're know an end, alas our leases would.
What hast thou then, proud flesh and bloud, to boast?
Thy dayes are evil, at best; but few, at most;
But sad, at merriest; and but weak, at strongest;
Unsure, at surest; and but short, at longest.
Fran. Quarles.

Francis Quarles was evidently much interested in this pastoral poem of Fletcher's for not content with his two introductory contributions, Quarles has added a third appreciation which is printed at the end and closes the volume of the first edition.

Phineas Fletcher had quite a vogue in the 17th and 18th centuries. "The Purple Island" was issued in a number of editions, being printed with the "Piscatorie Eclogues," as in the first edition, and also sometimes with the poem of his brother Giles. The "Piscatorie Eclogues" were also reprinted with his poetical miscellanies in several editions.

Quarles' final contribution is as follows:

To my deare friend, the SPENCER
[sic!*] of this age.

Deare friend,

No more a Stranger now: I lately past
Thy curious Building; call'd; but then my haste
Deny'd me a full draught; I did but taste.

---

*Quarles' spelling.

*Quarles' spelling.

Thy Wine was rich and pleasing; did appeare
No common grape; My haste could not forbeare
A second sippe; I hung a Garland there:

Past on my way; I lasht through thick and thinne,
Dispatch'd my businesse, and return'd agen;
I call'd the second time; unhors'd, went in:

View'd every Room; each Roome was beautifi'd
With new Invention, carv'd on every side,
To please the common and the curious ey'd:

View'd every Office; every Office lay
Like a rich Magazen; & did bewray
Thy Treasure, op'ned with thy golden key:
View'd every Orchyard; every Orchyard did
Appeare a Paradise, whose fruits were hid
(Perchance) with shadowing Leaves, but none forbid:

View'd every Plot; spent some delightfull houres
In every Garden, full of new-born flowers,
Delicious banks, and delectable bowers.

Thus having stepp'd and travell'd every staire
Within, and tasted every fruit that's rare
Without; I made thy house my thorough-fare.

Then give me leave, rare Fletcher, (as before
I left a Garland at thy Gates) once more
To hang this Ivie at thy Postern-doore.
Francis Quarles.

This poem has had a curious experience and suffered from a quasi-plagiarism. In 1864 Thomas Westwood, the admiring student of Izaac Walton, published a bibliographical chronicle of Walton's "Compleat Angler." In the second edition, among other additions, the new editor, Thomas Satchell, has lifted this poem of Quarles and reprinted it as the final gem of this otherwise meritorious study of Westwood's. The only change is the substitution in the final stanza of Walton's name for that of Fletcher. Of course such a transfer is a stupidity for this poem of Quarles has a special significance where it belongs, and is quite inappropriate in Westwood's book. Although Quarles is maltreated by Satchell in that his commendation of Fletcher is turned into praise of Walton still Quarles is given full credit for the authorship. At least one careful editor of Walton has been deceived by this literary loan of Thomas Satchell; R. B. Marston has reprinted the whole chronicle of Westwood and Satchell with its stolen poem in his magnificent edition of the "Compleat Angler" (1888) usually referred to, though erroneously, as the hundredth edition.

BOOK REVIEWS

The Physician of the Dance of Death. A Historical Study of the Evolution of the Dance of Death Mythus in Art. By Aldred Scott Warthin, PH.D., M.D., LL.D., Professor of Pathology and Director of the Pathological Laboratories, University of Michigan. 92 illus. N. Y., Paul B. Hoeber, Inc., 1931.

This monumental work is the outgrowth of an impression made upon Warthin when as a young medical student he saw for the first time Albrecht Dürer's Ritter, Tod and Teufel. It evoked in him an interest in Death, not morbid but philosophical, that lasted throughout life.

The book testifies not only to Warthin's scholarship and to his familiarity with foreign languages but also to his enormous patience and perseverance in collecting innumerable representations of the Dance of Death from the available literature, pictures and sculpture. The first Dance of Death to which an exact date can be assigned is the famous Danse Macabre of the cloisters of the Churchyard of the Innocents of Paris. It was begun and finished in 1424. Much has been written about the origin of the mysterious word Macabre but no definite conclusion has been reached.

In the Paris Danse Macabre the physician has the twenty-first place in the chain of dancers; he is tenth from the end. No place or mark of honor is accorded to him. From this we may conclude that his social position at the time was not very high. This view receives circumstantial confirmation from the fact that among the guilds of Florence the physician's is one of the lowest.

Warthin gives a fascinating description of the great Holbein's Dance of Death and of the Holbein alphabet in which the same motif is used. There is now in the collection of Mr. Lessing J. Rosenwald of Philadelphia a very beautiful set of the Holbein alphabet as well as of Holbein's drawings of the Dance of Death.

Like Copernicus' "De Revolutionibus Orbium Coelestium," the appearance of Warthin's book was practically synchronous with the author's death. Typographically, it is a work of art and is worthy of being placed in the library of every physician and scholar.

David Riesman.

The Edwin Smith Surgical Papyrus. Published in facsimile and hieroglyphic transliteration with translation and commentary in two volumes. By James Henry Breasted. Illus. The University of Chicago Oriental Institute Publications. Univ. Chicago Press, 1930, Vols. 3 and 4.

Edwin Smith, who was born in Connecticut in 1822, was one of the pioneers in the study of Egyptology. After some preliminary studies in London and Paris he went to Egypt to live, and in 1862, at Luxor he bought the papyrus which bears his name. Although he recognized that it was a treatise on medicine and studied its contents he never published anything about it. After his death his daughter presented it to the New York Historical Society in 1906. In 1920 the Society requested Dr. Breasted to undertake its translation and his labors have resulted in the two magnificent volumes before us.

According to Breasted the original text of the Smith Papyrus was composed by a surgeon about 3000 B.C. and the present manuscript was copied from it in the seventeenth century B.C., by a scribe who added his glosses and commentaries to the earlier text. Breasted advances the supposition that possibly the original was the work of Imhotep, the great physician and architect who flourished in the thirtieth century B.C. As we have it the Smith Papyrus is a surgical text of that century with the commentaries of another surgeon written one thousand years later.

The features which distinguish the Smith Papyrus from the Ebers Papyrus or any other of these ancient medical documents are summed up by Dr. Breasted as follows: (1) It is the oldest known *surgical* treatise. (2) It consists entirely of case reports not recipes. (3) It is systematically arranged, beginning with injuries of the head and proceeding downward. (4) The treatment prescribed is rational and chiefly surgical. In only one case is there a resort to magic. (5) Cases are classified as favorable, uncertain and unfavorable. The last classification, "an ailment not to be treated," is found in no other Egyptian medical treatise. (6) This unfavorable verdict occurs in fourteen of the reported cases, an indication as Breasted points out that the surgeon is only led to discuss them by scientific interest. In each case the surgeon details his examination of the patient by asking him questions and by objective methods such as palpation and manipulation, and what is especially important from the historic point of view, "observation of the heart by means of the pulse." In a number of the cases the writer adds his conclusions based on the facts determined in the examination.

In treating wounds the surgeon used lint and linen. He used adhesive plasters to draw gaping wounds together, as well as sutures, and his knowledge of bandaging possibly owed something to the art of the embalmer, whom Breasted terms "the most skilful bandagist of antiquity." For fixation he applied a variety of splints made of wood, or of linen impregnated with glue and plaster and moulded to fit the limb.

As many of the surgical conditions described in the text were due to spear and sword wounds, and as the patient is always a man, it is presumed that the author was an army surgeon, though a number of the injuries described might have been received in civil life. The construction of the Pyramids and temples must have been attended with many accidents and cases of this nature are included in the text. The writer displays a knowledge of anatomy which must have been acquired in other ways than by the practice of embalming, which is supposed to have familiarized the Egyptians with human anatomy.

The author of the text recognizes the heart as the center of the circulation and studies its condition by counting the "strokes" of the pulse. He notes that injuries to the brain affect distant parts of the body, remarking the dragging of the foot seen after cerebral injuries, and he recognizes that the spinal cord is also in direct relation with the peripheral nerves.

It is tempting to quote cases from the body of the text but space does not permit. Many of the case reports show a remarkable resemblance to those contained in the works of Hippocrates. Dr. Breasted in the General Introduction writes concisely but sufficiently of the debt which Greek medicine owed to Egyptian sources, directing attention among other things to the great Alexandrian anatomists, Erasistratus and Herophilus, who did such wonderful work in Egypt in the third century B.C., when the Alexandrian physicians, "found themselves among the surviving native Egyptian medical schools and medical libraries of the Delta, where such contacts and influences as we have suggested could hardly have been escaped." This magnificent work is absolutely essential to anyone who would attempt to study the beginnings of medical science. It throws an entirely new light on the whole subject and will cause a revision of many of the views hitherto maintained not only regarding the medical knowledge of the Egyptians but that of other peoples as well. All students of medical history owe a great debt to Dr. Breasted for the flood of light which his labors have thrown on a hitherto practically unknown or little understood field.

SCIENCE AND THOUGHT IN THE FIFTEENTH CENTURY. Studies in the History of Medicine and Surgery, Natural and Mathematical Science, Philosophy and Politics. By Lynn Thorndike. N. Y., Columbia Univ. Press, 1929.

This book will go far to correct the generally prevalent misapprehension or prejudice which disregards the culture of the fourteenth and fifteenth centuries, thinking that medieval civilization declined in the fourteenth century and regarding any glimmerings of science which may be found in that or the fifteenth century as merely forerunnings of the so-called Renaissance and not evidences of any real cultural background in that period. Thorndike points out that it is only in comparatively recent times that careful study of the later centuries of the Middle Ages has revealed how much scientific work of real value was done in them. His book is made up of a number of studies which illustrate this point. Of particular interest to the student of medical history we may indicate the following papers. In an article entitled "Medicine versus Law" we find a description of some fifteenth century writings in which the authors wrangled over the question of the relative importance of law and medicine. The authors were distinguished men of letters and the manuscripts of their writings are contained in the Laurentian Library at Florence. The subject was apparently considered in a purely polemic way, with all the zest which characterized most of the scholastic arguments which prevailed to the end of the Middle Ages. The discussion of the "Manuscript Text of the *Cirurgia* of Leonard of Bertipaglia," and "A *Practica Circurgie* ascribed to John Braccia of Milan or to Peter of Tossignano" contains much material of interest in two important medieval surgical treatises. "Some Minor Medical works written at Florence" deals with some very characteristic but scarcely known fourteenth century medical writings. In the next article "A Fifteenth Century Autopsy," Dr. Bernard Torrinus, of Florence, reports the results of an autopsy which he made on the son of an eminent judge, he and the father both concurring in the farsighted endeavor to ascertain if the disease which killed the boy was hereditary, and to see whether they could gather information of value to the health of the rest of the judge's family.

The remainder of the contents deal chiefly with philosophical and mathematical studies. Dr. Thorndike's book should prove an admirable corrective to some of the too prevalent misconceptions regarding the history of science in the Middle Ages. The original manuscripts from which the studies were made are transcribed in the form of appendices. The book is a triumph of American scholarship and of the greatest value to the student of medieval culture.

THOMAS HOLLEY CHIVERS, FRIEND OF POE, WITH SELECTIONS FROM HIS POEMS. A Strange Chapter in American Literary History. By S. Foster Damon. N. Y., Harper & Bros., 1930.

In all the many articles which appear from time to time on the physician in literature we cannot recall a mention of the subject of this biography. The names of Oliver Wendell Holmes, S. Weir Mitchell and others are frequently cited but that of Thomas Holley Chivers, M.D., has been allowed to pass into oblivion so far as his relation to medicine is concerned. In fact except for a few scholars of American literature, his very existence is practically forgotten were it not for his connection with Edgar Allen Poe. Chivers was born on October 18, 1809, on his father's large plantation near Washington, Georgia.

When hardly more than a boy Thomas Holley Chivers married a still younger girl. After a very short period of married life she suddenly left him taking with her a child which had been born to them. It is said that the young wife had been told some slanderous stories about him. Be that as it may he never again saw either his wife or his child. In his despair Chivers determined to study medicine. He entered the Transylvania Medical School, from which he received the degree of M.D. in 1830, it is said with distinction. If he ever practiced medicine it must have been in a very perfunctory manner. His father was rich and generous and possibly in an effort to aid his son shake off his matrimonial woes, allowed him ample means to follow his literary pursuits. Curiously enough all his life his signature to his writings is always followed by M.D. While a student at Transylvania Chivers wrote much poetry and by the end of his life his output had become something stupendous. Mr. Damon says that, "Chivers' medical training left its mark on his brain. He knew of death now, not merely from having seen it, but as a doctor knows it." One third of his poems deal with death or death-beds. He loved to describe the physical details of dying and much of what he wrote is so ludicrously realistic as to become ridiculous. However, the prevailing taste in literature was for the morbid and sentimental and Chivers' poems were read, quoted and reprinted in the newspapers. He brought out most of them in book form, printed at his own expense. By 1837 he had so far overcome the disappointment of his first matrimonial experience as to take unto himself a second wife, a Miss Harriet Hunt, of Massachusetts. She was but sixteen at the time of her marriage, but seems to have made him very happy until death separated them.

Poe and Chivers were familiar with each other's writings and maintained a correspondence for some years before they actually met. Their first encounter took place on a street in New York. Poe was very drunk and Chivers helped him home. Thenceforth they saw each other at intervals and Poe tried to get Chivers to advance him money on many occasions. Because of certain striking points of resemblance in versification and ideas in some of their poems the opinion that Chivers plagiarized from Poe has been quite prevalent. Mr. Damon proves conclusively that in most instances of this kind Chivers' verse antedates Poe's, so that if there were plagiarism it was Poe who was guilty. On the other hand he shows that in no instance is there evidence of real plagiarism. Both men were under the same influences as regards inspiration and the forms they used to express it, and this is the true explanation of the resemblances found between them.

In 1841 Chivers published "Isadore." Poe's "Raven" appeared in 1845. The following lines from "Isadore" will illustrate the similarity between it and "The Raven":

> While the world lay round me sleeping,
> I alone for Isadore
> Patient Vigils lonely keeping,
> Some one said to me while weeping:
> "Why this grief forever more?"
> And I answered: "I am weeping
> For my blessed Isadore."

Chivers inclined strongly to the mystical. He dabbled with spiritualism, mesmerism and Swedenborgenism. In many ways he greatly resembled William Blake, though he never seems to have practiced the peculiar eccentricities of Blake in private life.

In 1846 Chivers was elected Professor of Physiology and Pathology in Oglethorpe Medical College, but declined the position. He died on December 12, 1858, and is buried in the Town Cemetery in Dacatur, Ga.

Mr. Damon has written a charming biography of an interesting character. The name of Thomas Holley Chivers, M.D. should henceforth rank high among the medical lights of literature.

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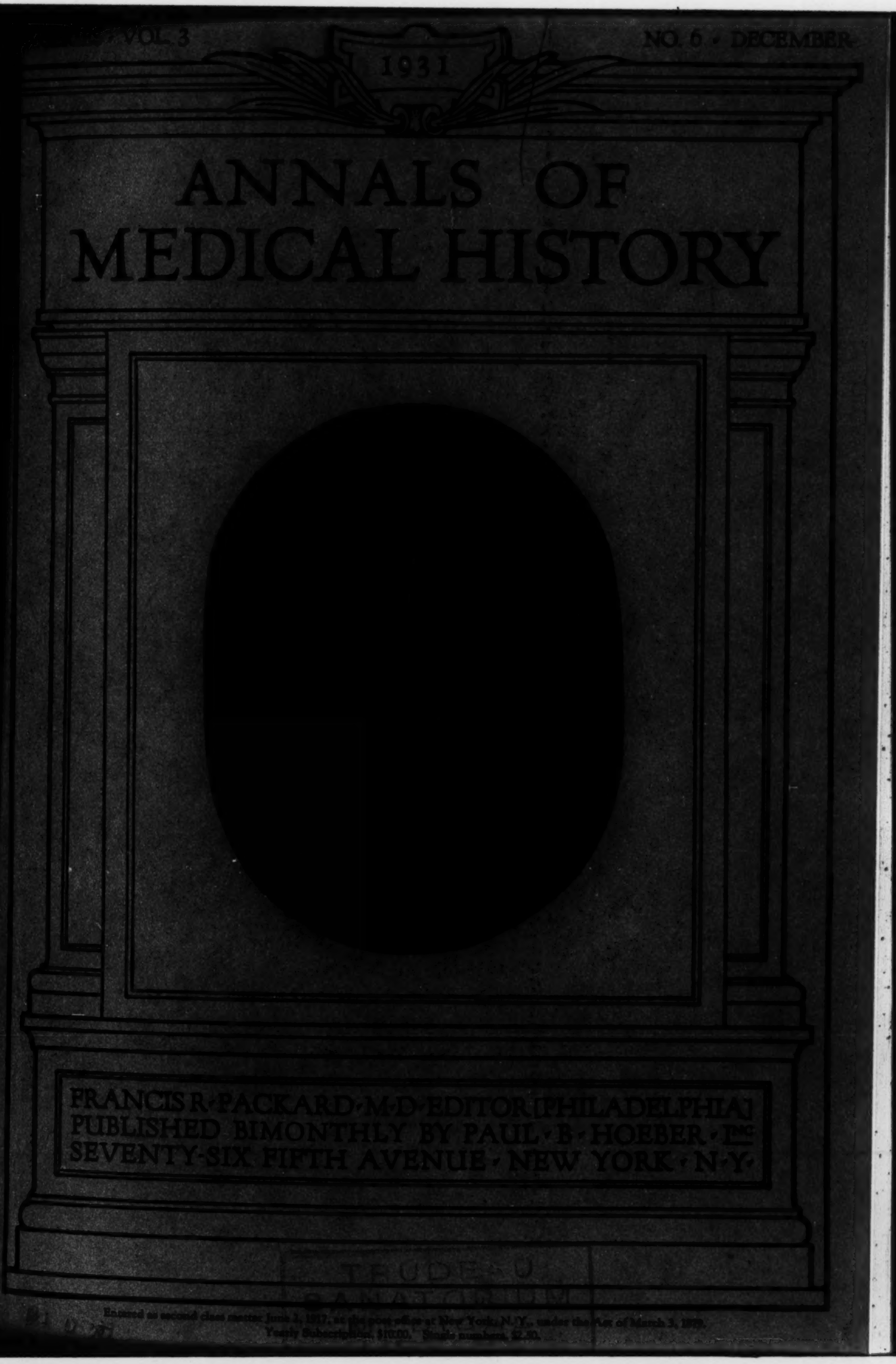

ANNALS OF MEDICAL HISTORY

FRANCIS R · PACKARD · M · D · EDITOR [PHILADELPHIA]
PUBLISHED BIMONTHLY BY PAUL · B · HOEBER · INC
SEVENTY-SIX FIFTH AVENUE · NEW YORK · N · Y ·

TRUDEAU
SANATORIUM

Entered as second class matter June 2, 1917, at the post office at New York, N. Y., under the Act of March 3, 1879.
Yearly Subscription, $10.00. Single numbers, $2.50.

ANNALS OF MEDICAL HISTORY

Editor: FRANCIS R. PACKARD, M.D., Philadelphia

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Annals of Medical History
December, 1931

Carl Voit